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Pulling Together for Free Trade

CLYDE PRESTOWITZ ON
MAKING THE TREATY WORK



ALSO IN THIS ISSUE:

ENDING THE SCOURGE OF CHEMICAL WEAPONS
NORWAY'S BRUNDTLAND ON SUSTAINABLE DEVELOPMENT
HOW TO KEEP THE OCEANS OIL FREE
LESSONS FROM THE FUTURE



technology review

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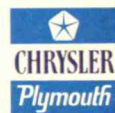
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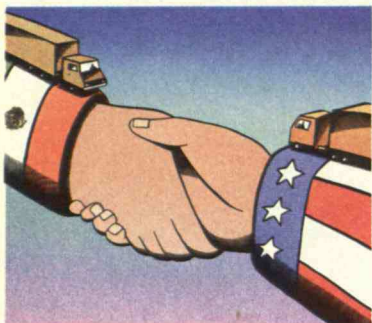
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Contents

FEATURES



22

22 MAKING THE FREE-TRADE AGREEMENT WORK

BY CLYDE PRESTOWITZ

The pact to open the U.S.-Mexican border to an unrestricted flow of goods could mean a prodigious loss of jobs, as well as other economic ills, for the United States. But the signatories could instead work together—without renegotiating NAFTA—to create mutual benefits.

28 WILL MANUFACTURING HEAD SOUTH?

BY HARLEY SHAIKEN

Without common standards for all of North America, the treaty could reduce wages and impair working conditions in the United States and Canada.

30 NAFTA AND THE ENVIRONMENT

BY ROBERTO SÁNCHEZ

To help avoid job-migration disputes, treaty signatories must cooperate to strengthen Mexico's notorious record of environmental neglect.

32 ENDING THE SCOURGE OF CHEMICAL WEAPONS

BY JAY BRIN

Eliminating this especially inhumane form of warfare will entail the most massive, costly, and intrusive monitoring effort the world has ever seen.

42 TO KEEP THE OCEANS OIL-FREE

BY JUDITH TEGGER KILDOW

Although the oil-transport industry and its official overseers promised to clean up their act after the *Exxon Valdez* disaster, they have failed to follow through or are pursuing ineffective solutions. Doing it right will require new technologies, better systemwide management—and cuts in oil use.

50 TOMORROW AND TOMORROW AND TOMORROW

BY W. WARREN WAGAR

The descendants of technology prophet H.G. Wells draw on a wide variety of disciplines to project plausible visions of the future. Their objective is to help humanity choose where it wishes to go and tread the most enlightened paths.

60 THE ROAD FROM RIO

AN INTERVIEW WITH GRO HARLEM BRUNDTLAND

The prime minister of Norway—the founding mother of sustainable development—analyzes the Earth Summit and its aftermath.



32

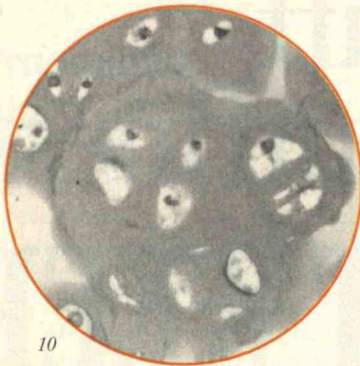


42



60

DEPARTMENTS



10

5 FIRST LINE

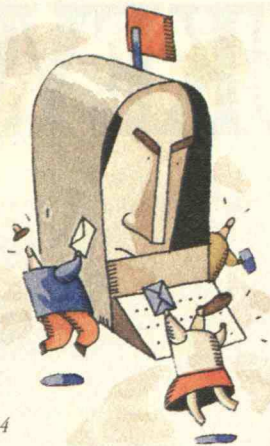
6 LETTERS

10 MIT REPORTER

Growing New Cartilage to Fight Arthritis
Of Mice and Men: Gene Mapping

14 TRENDS

E-Mail: The Boss Is Watching
Pharmaceuticals from the Sea
The New(er) Math
Spaceflight on a Shoestring
Field of Worms



14

66 FORUM

GAR ALPEROVITZ

How the Mayo Clinic has built a medical system that works *and* has a heart.

68 THE HUMANE ENGINEER

SAMUEL C. FLORMAN

Engineering progress has a role to play in assuring peace—preventing ethnic hostilities within a country from turning into Bosnian-style conflict.

70 THE ECONOMIC PERSPECTIVE

BENNETT HARRISON

Bill Clinton could make real headway on infrastructure once he determines how much money to spend, where to get it, and how to assure local benefits.

72 REVIEWS

Television: Evelyn Hammonds on the trials of modern health care.

Books: Will Warner on robotic weapons as an extension of nature's arms race.



72

80 NOTES

Electric Jell-O, Medical Stunts with Stents, Not-So-Special Effects,
Buckyball Bearings

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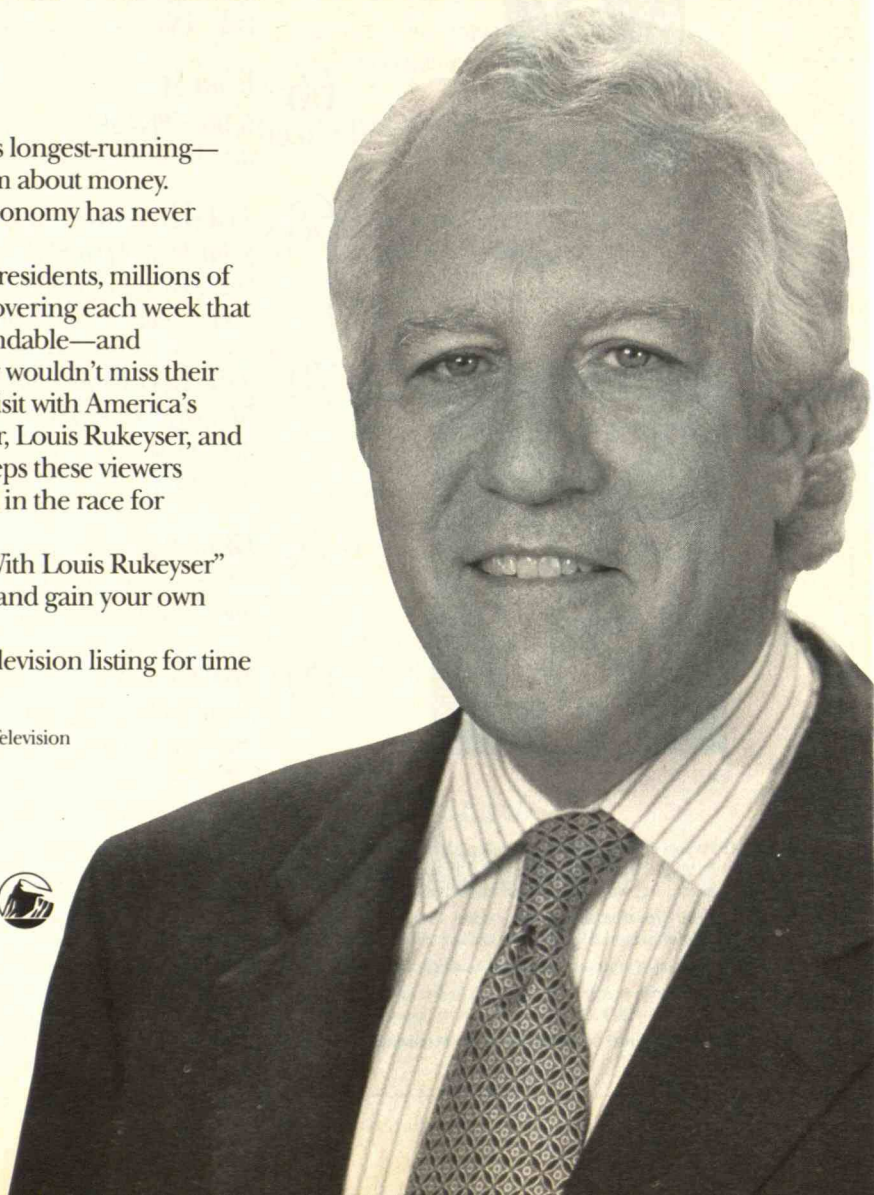
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First Line

A Pragmatist in the White House

Science advising at the top often resembles unrequited love," observed Daniel S. Greenberg, editor of *Science & Government Report*, in last month's *Technology Review*. While scientists are ardent in trying to edify the president, their attentions are usually spurned.

One reason is that science advisers tend to be politically naive. Unfamiliar with Washington-style negotiation and compromise, and frequently representing the interests of the science community more than those of the president, they are soon consigned to oblivion by White House staffers.

Another reason is that science advisers' recommendations, even if they reach the chief executive's ear, are of limited value because they generally concern basic research rather than the practical applications of science that directly relate to the well-being and prosperity of the country.

But there's a new day in Washington. Bill Clinton's science adviser—John H. Gibbons, director of the congressional Office of Technology Assessment since 1979—leans toward the pragmatic. A physicist by training, Gibbons shifted into technology policy early in his career. Before going to OTA, he led the environmental studies program at Oak Ridge National Laboratory, directed the Energy, Environment, and Resource Center at the University of Tennessee, and headed conservation programs at the Federal Energy Administration.

Along the way, Gibbons apparently came to believe that greater payoff can often be derived from using less and that symptoms of economic trouble, such as pollution, are best addressed at their roots. As he wrote in "The Conservator Society" (a 1988 article in *Issues in Science and Technology*), "long-recognized problems—acid rain, urban and regional air pollution, species extinction, water degradation, human dislocation,

and capital shortages and debt—like global warming, all reflect the inefficient use of resources." He argued that the "careful stewardship of resources" was therefore essential to economic growth both at home and abroad. Such a point of view nicely complements that of the president, who has asserted that "our future depends on maintaining a sustainable environment, on conserving our resources [to] create economic opportunity."

This science adviser is also politically

*The new science
adviser appreciates the
importance of practical
considerations.*

savvy, familiar with the ways of Washington, and of Capitol Hill in particular. During his 13 years at the helm of OTA, the agency—working in a hardball arena of easily dissatisfied patrons—turned out a steady stream of technology-policy studies notable for their usefulness to congressional decision makers. These reports drew on reliable expert knowledge and judgment, and they featured ranges of practical alternatives rather than partisan or advocacy-style conclusions. As Gibbons told *Technology Review* editors in a 1988 interview, his experience at OTA helped teach him how to "delve into critical political issues and not get blown up in the process."

Gibbons's emphasis on technology policy, his experience at helping formulate that policy, and his survival abilities in highly charged political environments should make him not only an effective science adviser to the president but a useful colleague for the whole Clinton team. He could be of particular value to Vice-President Al Gore, the designated technology czar, himself no slouch among technology aficionados.

Gibbons could also complement the erudite but practical orientation of Laura D'Andrea Tyson, chief of Clinton's Council of Economic Advisers. Tyson is "an unconventional economist with a dazzling intellect," wrote *Boston Globe* columnist Bob Kuttner, "who chooses to work in English rather than algebra and to study the real economy rather than build sand castles."

Gibbons seems to appreciate that solutions to public-policy problems must transcend disciplines and involve more than technical fixes. When introduced to the press by Clinton in December, Gibbons reiterated that "our security and prosperity depend as never before on the sustained support of science and the thoughtful use of technology." But as he told his *Technology Review* interviewers a few years before, "part of the answer" to U.S. problems in world trade "will depend on how much attention we pay to social issues such as education. In the long term our economic hopes depend on human resources. So far we haven't spent much time thinking about the social processes by which we manage technology."

Such a human-centered approach appears to sit well with the new administration. We've heard less from Clinton on such exotica as space stations and superconducting supercolliders and considerably more on social mechanisms such as technology extension services, a new civilian technology agency, and government-industry partnerships. The president has also assigned great priority to education and training—prominent components of his much cherished emphasis on "infrastructure."

Gibbons even complements the administration in its monumental challenge to pursue such programs for improving things in the here and now while maintaining reasonable levels of basic research for the future—and at the same time keeping the tab manageable. One of Gibbons's specialties, he told *TR* interviewers, is "trying to figure out how to do something for less." ■

—STEVEN J. MARCUS

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Letters

LIFE ON FILM

In "Photographing the Miracle of Life" (TR November/December 1992), Joelle Bentley presents an excellent biography of Lennart Nilsson. Unless you have worked in the field of medical imaging, it is hard to appreciate the monumental contribution Nilsson has made to the



public understanding of both the anatomy and the pathology of the human body.

He is a true visionary and pioneer. To my knowledge, he was the first investigator to place a catheter, a light, and a lens at the end of a fiber optic cable to see deep inside the body. Today needles, catheters, and fiber-thin wands are performing miracle operations guided by miniature sensors—"seeing eyes" threaded into body cavities and the bloodstream. Entire surgical procedures are viewed by a surgeon on a television screen. And building on Nilsson's techniques, investigators are also making the entire range of the electromagnetic spectrum visible.

Ernest Haas, the late great philosopher-photographer, once advised his students to "do what no one else is doing in photography and do it better than anyone else." Nilsson has followed this advice.

HOWARD SOCHUREK
Delray Beach, Fla.

The writer was a photographer for Life magazine from 1950 to 1970.

SUNUNU'S MINDSET

In "The Political Pleasures of Engineering" (TR August/September 1992), John Sununu displays at least four fundamental misconceptions. First, the assertion that there is no scientific basis for concern about global warming flies in the face of a broad consensus among atmospheric scientists. The Intergovernmental Panel on Climate Change estimates an average surface warming of 1.5 to

4.5° C over the next century in a business-as-usual scenario, with higher-than-average warming in temperate northern latitudes.

Second, the assertion that the United States cannot significantly reduce its CO₂ emissions without harming the economy runs contrary to both historical experience and a number of recent studies, including one from the National Academy of Sciences. The U.S. economy has grown by almost 60 percent since 1973 with no increase in CO₂ emissions. There is no reason to think that this trend cannot continue. My organization, the Alliance to Save Energy, recently joined the American Gas Association and the Solar Energy Industries Association in issuing a report that shows how more rapid deployment of energy-efficiency, renewable-energy, and natural-gas technologies could bring U.S. CO₂ emissions for 2010 12 percent below 1990 levels with no reduction in economic growth. Indeed, if we do not meet this challenge, we will lose world markets to our competitors.

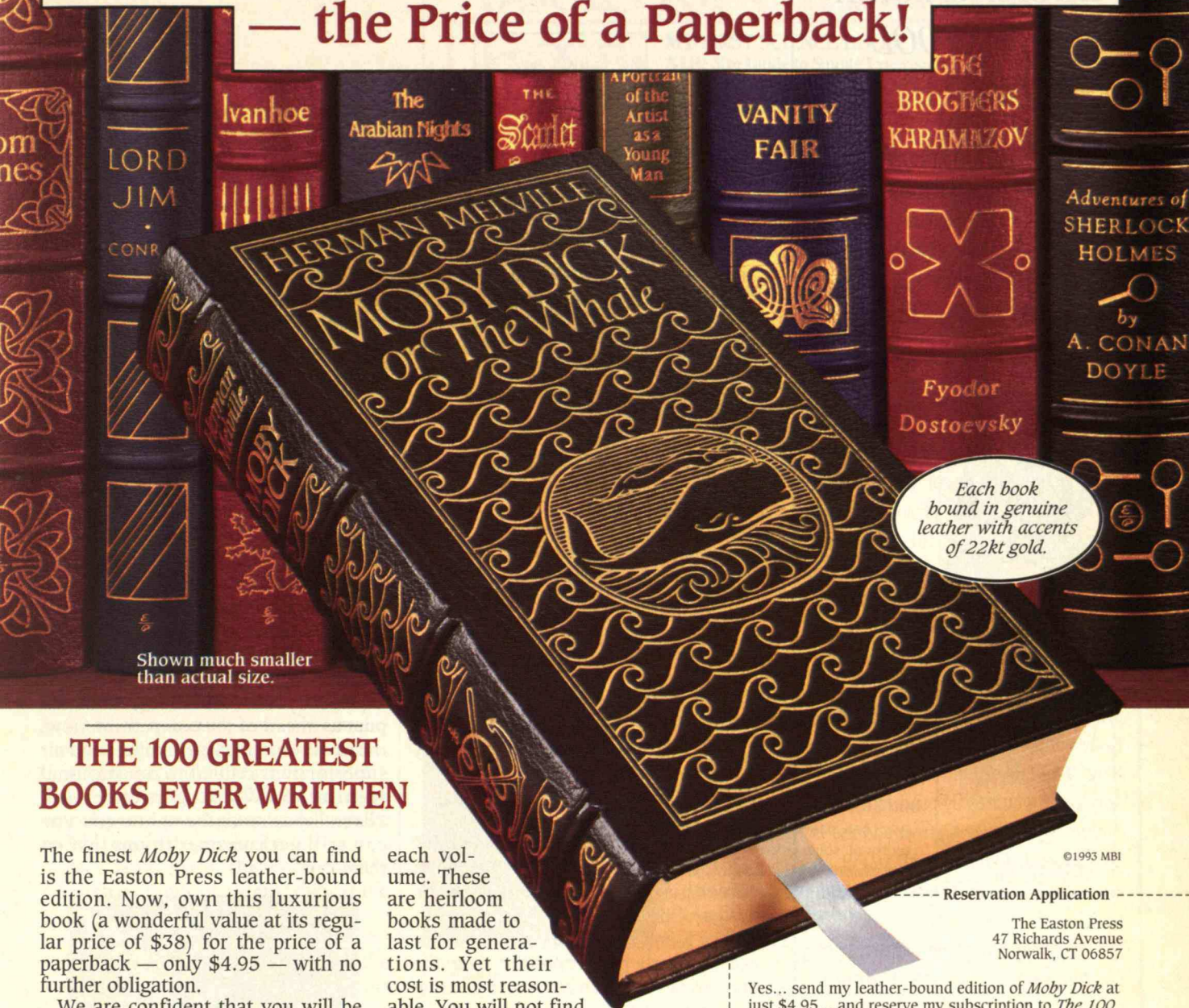
Sununu's third misconception is that environmentalists want to stop economic development. In truth, mainstream environmental organizations have embraced the concept of sustainable development, which recognizes that economic growth and environmental protection are interdependent. The environmental community is working with industry to identify and promote new technologies that will simultaneously strengthen the economy and protect the environment.

And finally, Sununu's fourth misconception is that government has no major role to play in dealing with economic and environmental issues. The fact is that only government can make the market pay for the social costs and benefits of different options. Ideally, that job would be done through mechanisms such as pollution taxes rather than command-and-control regulations.

WILLIAM A. NITZE
President

The Alliance to Save Energy
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LOOKING FOR A FEW GOOD PHOTOGRAPHERS

It may be your turn to display your work in a *Technology Review* photo essay. We are holding a photo contest on the general theme of "ENCOUNTERING THE MACHINE"—how people interact with technology,

whether motivated by love, hate, or anything in between. We will publish a selection of the winning photographs later this year and award prizes of

\$500, \$300, and \$200 to the first-, second-, and third-place winners.

To enter, please send no more than six previously unpublished entries—prints or slides in a sleeve—to Photo Essay Contest, *Technology Review*, MIT, Bldg. W59-203, Cambridge, MA 02139. For sending entries by overnight mail, *Technology Review's* street address is 201 Vassar St., Cambridge, MA 02139. All entries must be postmarked no later than June 1, 1993.

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Good luck!

MARKETING ELECTRIC CARS

In "EVs: On the Road Again" (*TR August/September 1992*), Gill Andrews Pratt points out that the relatively short range and long recharge times of electric vehicles have prompted some manufacturers to concentrate on the fleet market and the "pure" commuter market—those people who own a second car almost exclusively for commuting. But a different strategy could open up the much larger market of households with only a single car, or with multiple cars, all of which are used for more than just commuting.

Aside from price, the major impediment to purchasing an EV as one's sole vehicle is the inability to use it for occasional extended trips. EV producers could substantially overcome that impediment by offering, say, discounts on occasional rentals of conventional cars, or even a weekend's free rental for every 1,000 miles the EV is driven.

ANTONY HODGSON
Harvard-MIT Division of
Health Sciences and Technology

REFRIGERATORS: BACK TO THE PAST

In "If It Ain't Broke, Don't Break It" (*TR October 1992*), Thomas Magliozzi voices his disenchantment with the design of household refrigerators. But I'd like to inform readers of a discontinued yet nearly perfect product from the once-great American consumer-pleasing corporation known as General Electric. Specifically, the product is the General Electric Wall Refrigerator-Freezer, model LW-11N, circa 1957-58. Our household enjoys two of them.

The LW-11N, which hangs on the wall like a kitchen cabinet, has a relatively shallow horizontal box with three side-by-side doors to minimize the "last in, first out" syndrome. Two eye-level compartments with lightweight easy-opening doors provide fresh-food storage. The unit also comes with a wall-mounted steel hanger for positioning it to suit the height of the household members who use it most.

Unfortunately, GE abandoned the LW-11N around 1960. It was relatively expensive and potential customers may have thought they were being cheated, since the conventional stand-up, deep-dimension boxes had greater storage capacity. But I have discovered that younger men and women tend to view our two LW-11Ns as something new and sort of wonderful, once they realize what it is that's hanging on the wall. Perhaps these admirers will be motivated to reintroduce the idea—using the most energy-efficient and low-noise mechanisms available, of course.

R.A. NUETZMAN
Pasadena, Calif.

MAINTAINING AIR SUPERIORITY

In "The F-22: An Exercise in Overkill" (*TR August/September 1992*), David Callahan claims that the fighter plane is a bad investment because the F-15, which performed admirably in Desert Storm, is enough to maintain our air superiority. But even though the F-15 puts us ahead of the competition now, the situation is likely to change, and air superiority is crucial to our national security. As Will Rogers once said, "Even if you're on the right track, you can still get run over if you just sit there."



The success of American F-15s in Desert Storm should be seen as a validation of our past commitment to leading-edge technology—not as an excuse to ignore the inevitable aging of an aircraft's design and airframe. The Air Force will have to begin retiring those planes around the turn of the century as they reach the end of their service life—which is approximately 30 years, as has

MIT Reporter

GROWING NEW CARTILAGE TO FIGHT ARTHRITIS



Laboratory-grown cartilage is helping MIT researchers unravel the biomechanics of osteoarthritis, a degenerative disease that afflicts nearly 16 million people in the United States alone. Wear and tear on articular cartilage—the slippery shock-absorbing connective tissue that coats joint surfaces—has long been considered the likely villain. Alan Grodzinsky, an MIT professor of mechanical, electrical, and bioengineering, and his students think that the process is actually more complicated.

The group tests cartilage using samples grown in flat glass chambers. Grodzinsky starts by separating cells called chondrocytes from a cow's knee cartilage that has been dissolved by enzymes. He adds the cells to a warm broth of a purified form of agar, and lets the mixture cool into thin, almost transparent sheets resembling Jell-O.

As in normal cartilage, the chondrocytes then churn out the main components needed to form a tough, compressible matrix: collagen, a long, fibrous protein; and other proteins called proteoglycans. "Each cell in the gel develops a halo of this matrix, and these gradually merge, forming a dense, fairly uniform network," says Grodzinsky. Over a month or so, the flimsy gel becomes a stiff but flexible material that evaluations show is virtually identical to cartilage.

Mechanical testing of small disks punched from the material can reveal how cartilage, which in healthy people is undergoing both synthesis and degradation at the same time, responds to different loads and stresses. A steady, unchanging load, such as that on a joint immobilized in a cast, causes chondrocytes to slow the synthesis of new cartilage proteins. Compressing cartilage and keeping it in that state, Grodzinsky hypothesizes, raises the density of proteoglycans—which are negatively charged—in part of the cartilage,

throwing off that area's electrochemical balance. That change could interfere with chondrocytes' ability to manufacture proteins.

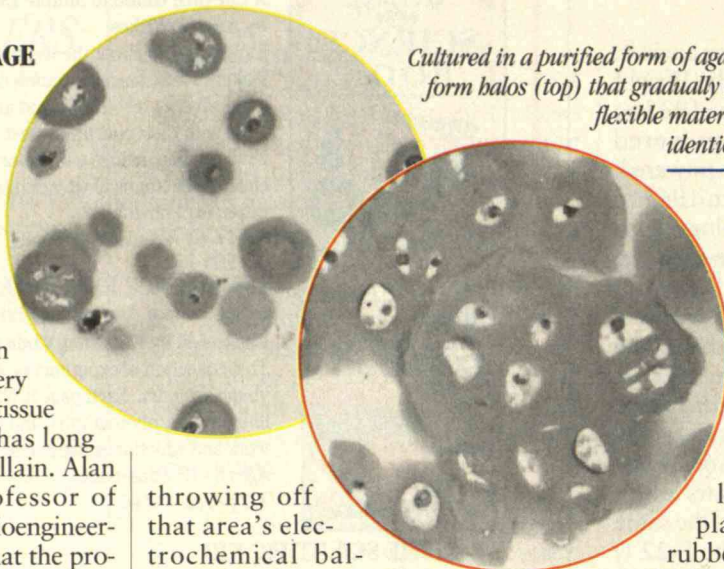
Impact loading from a repetitive activity such as jogging or from a single, forceful blow, can also make cartilage degenerate at a faster-than-normal rate. Grodzinsky guesses that the cause lies in an electrochemical imbalance or physical rupture of the cartilage matrix and the chondrocytes themselves.

Gentle, repeated motions, however, enhance the synthesis of cartilage and reduce its rate of degradation. Such "dynamic loading" may explain why a relatively new technique called continuous passive motion helps rehabilitate stiff joints after an operation. A therapist moves the injured joint once every 10 seconds or so, in the range Grodzinsky has shown most effectively stimulates matrix synthesis and inhibits breakdown. One line of reasoning is that the rhythmic compression and decompression of cartilage may help pump nutrients to chondrocytes that, unlike most cells in the body, aren't fed by blood vessels.

Cartilage Transplants

The MIT team has also used the cartilage disks to detect osteoarthritis at an early stage. Research by many groups has shown that cartilage essentially unravels in the body because of the

Cultured in a purified form of agar, cells from cow cartilage form balos (top) that gradually merge (bottom) into a stiff yet flexible material that tests show is virtually identical to the original substance.



gradual loss of the proteoglycans, which normally hold the spaghetti-like collagen fibers in place. Unfortunately, this change doesn't alter the way cartilage looks through an arthroscope, a tiny camera that can be inserted into a joint to look for rips in the cartilage or places where the material has rubbed off the bone. Grodzinsky and Myron Spector, director of rehabilitation engineering R&D at the West Roxbury Veterans Administration Hospital in Boston, are therefore developing a tiny probe that can detect proteoglycan loss. The probe will deliver a small jolt of electricity to the cartilage and measure how it responds. The tiny current will compress healthy cartilage high in proteoglycans more than cartilage that is losing these negatively charged proteins. "With an early warning system like this, you could think about treatment long before the entire joint degenerates," says Spector.

Further in the future, lab-grown cartilage may be used to repair joints damaged by osteoarthritis and avoid costly joint-replacement surgery. Orthopedic surgeons replace roughly 600,000 knees, hips, and shoulders each year in the United States. Chondrocytes removed from an individual could be grown on an artificial matrix until they generate healthy connective tissue that could be implanted onto the surface of a worn-down joint. In the past year researchers at Rush Medical College in Chicago have grown such "in-vitro cartilage" from human chondrocytes.

But such transplants face many obstacles, cautions Grodzinsky. A major hurdle will be merging the new cartilage with that remaining on the joint's surface firmly enough to withstand the enormous mechanical stresses of every-

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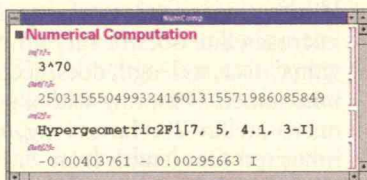
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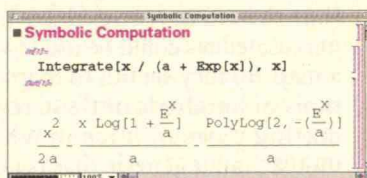
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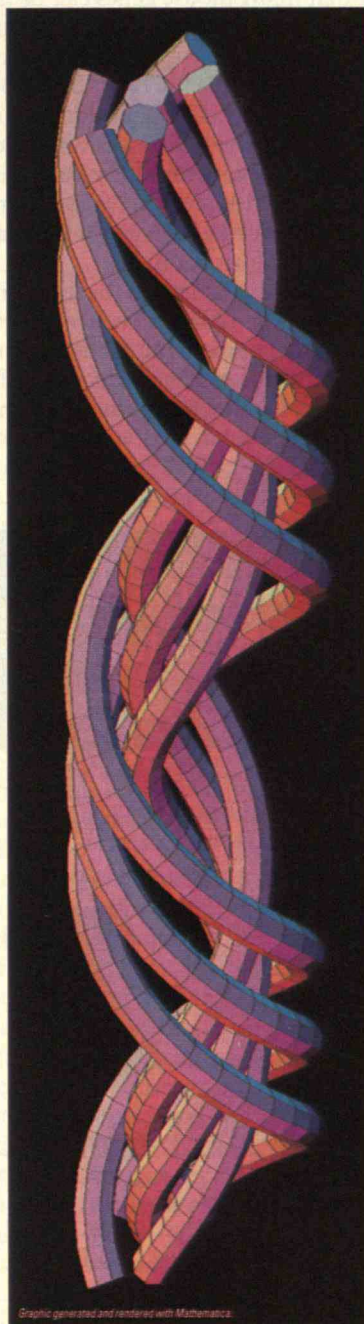


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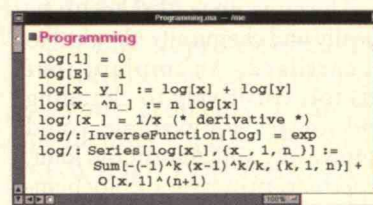
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Former MIT graduate student Young-Jo Kim (left) and engineer Alan Grodzinsky have studied the effects of different ways of compressing cartilage by using equipment (shown) that simulates natural loads.



day life. The substance also has to be mechanically and chemically identical to normal cartilage. An implant that responds too sensitively to changing loads and stresses, for example, could grow aggressively and deform the joint. Klaus Kuettner, professor of biochemistry and orthopedics at Rush Medical, says, "That's where Alan Grodzinsky's work characterizing the properties of in-vitro cartilage is so crucial."

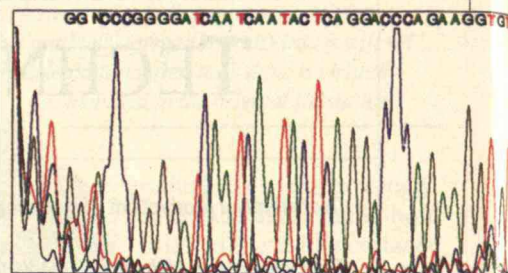
—P.J. SKERRETT

OF MICE AND MEN: GENE MAPPING



Mice may have smaller bodies and more fur than humans, but the genetics of the two mammals are so similar that many mouse genes can be used to study human diseases. With that in mind, researchers working in the laboratory of Eric Lander, an associate professor of biology at MIT and molecular biologist at the affiliated Whitehead Institute for Biomedical Research, have developed a new map of what lies along the mouse's chromosomes, which carry all genetic information.

The map, which notes the location of 1,000 sections of DNA, reduces the time researchers need to find genes controlling disease and other traits, according to Joseph Nadeau, a senior staff scientist



at the Jackson Laboratory in Bar Harbor, Maine. While this task used to take months or years, with the Lander map it takes weeks or days.

To create the mouse blueprint, the Lander team relied on the fact that the DNA that makes up chromosomes in turn consists of a linear array of 3 billion pairs of four basic chemicals, or bases, typically referred to as A, T, C, and G. Dispersed throughout the array are thousands of stretches of two alternating bases—CACACA—that repeat numerous times. Called microsatellites, these regions have no known function. While the location of a particular microsatellite doesn't vary among individual mice, its length does, according to inheritance. Offspring with a particular microsatellite 200 bases long, say, have inherited that length from either their mother or father.

Mapping Microsatellites

Lander and his colleagues had realized that the chromosomal positions of microsatellites could be used to develop a map. So they set out to map the locations of hundreds of these regions by mating pairs of mice in which one mouse had a genetic disease or other inherited characteristic whose chromosomal location was known. Mathematically, individuals have a greater chance of inheriting two traits—such as a disease plus a microsatellite of a particular length—the closer together on a chromosome the bases for those traits lie. Therefore, by determining how many offspring had both a particular disease and a certain microsatellite of the same length, the biologists could figure out

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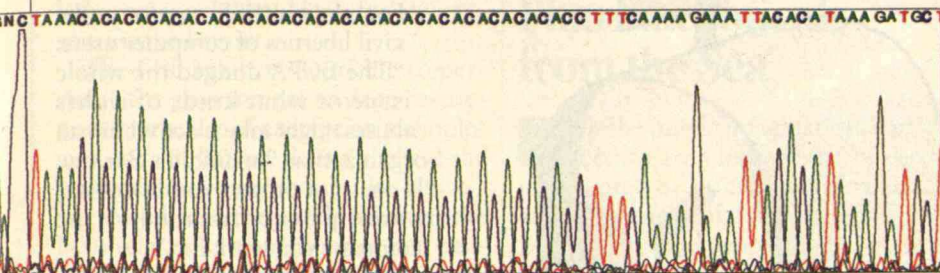


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stretches of two alternating basic chemicals known as C and A. The blue-and-green pattern of spikes near the center of this image of a partial DNA sequence indicates a microsatellite.

suming with the old mouse maps.

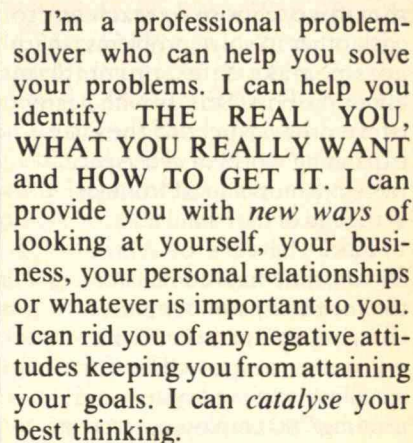
The Lander lab's technique for developing the map has met with the approval of the government-sponsored Human Genome Project (HGP) to the extent that it has expanded the effort's scope and its funding to \$8.3 million for the first year and \$24 million over five years. Lander will head a Center for Genome Research at the Whitehead Institute that coordinates a consortium of scientists from five institutions worldwide. The researchers' goal will be to make the mouse map more detailed and use a similar approach to map the human genome—the collective human genetic information.

The new map will change the direction of participants in the Human Genome Project attempting to characterize human chromosomes, according to Bettie Graham, the organization's research grants branch chief. Up to now, mapping efforts on the human genome have concentrated on studying one chromosome or one region of a chromosome at a time. With a couple of exceptions, that work has met with frustration because of the difficulty of isolating individual chromosomes or regions. The identification of microsatellite locations by tackling all the chromosomes at once worked so well, however, that Graham says her organization is "absolutely ecstatic."

—GWENDOLYN FREYD

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Trends

E-Mail: The Boss Is Watching

■ It hasn't replaced the telephone yet, but as a medium for personal communication, electronic mail is rapidly becoming the way millions of people, in both the home and the office, choose to reach out to each other to solve problems, share gossip, make dates, or complain about the boss. Still, as with nearly every other aspect of the ever-expanding world of cyberspace, there are murky legal frontiers at the end of the e-mail trail.

Take the case of Alana Shoars, the e-mail administrator for the Epson computer company in Torrance, Calif., who was responsible for installing an e-mail system and training 700 employees to create messages on their personal computers and send them over the network to their fellow workers. Shoars assured employees that their e-mail communications would be totally private, as she herself had been so assured.

Later, however, Shoars discovered that her supervisor, the manager of the mainframe that received, stored, and routed the messages was in fact copying and reading the employees' e-mail. When Shoars complained, she was fired. So she promptly took her employer to court. A class-action suit was also filed on behalf of all the employees whose e-mail had been opened.

The defendants argued that because state privacy statutes make no mention of either e-mail or the workplace, lawmakers never intended the law to protect an employee's electronic messages. The judge agreed and dismissed both cases, although the prosecuting attorney, Noel Shipman, has appealed the cases and is prepared to take them to the U.S. Supreme Court.

At the federal level the law is a little clearer. The Electronic Communications Privacy Act (ECPA) of 1986 was enacted

specifically to protect computer communications against interception and eavesdropping. Just as its precursor, the Wiretap Act of 1968, prohibited phone bugging, the ECPA prohibits any third party, be it individual, police, or government, from intentionally intercepting or disclosing the contents of a computer message without prior authorization. To obtain such authorization, the police or government must have evidence that a crime may be occurring through computer communication before they can snoop around.

But this law is still not explicit when it comes to the workplace, says John Barlow, a rancher-turned-hacker-advocate who with Lotus founder Mitchell Kapor started the Electronic Frontier

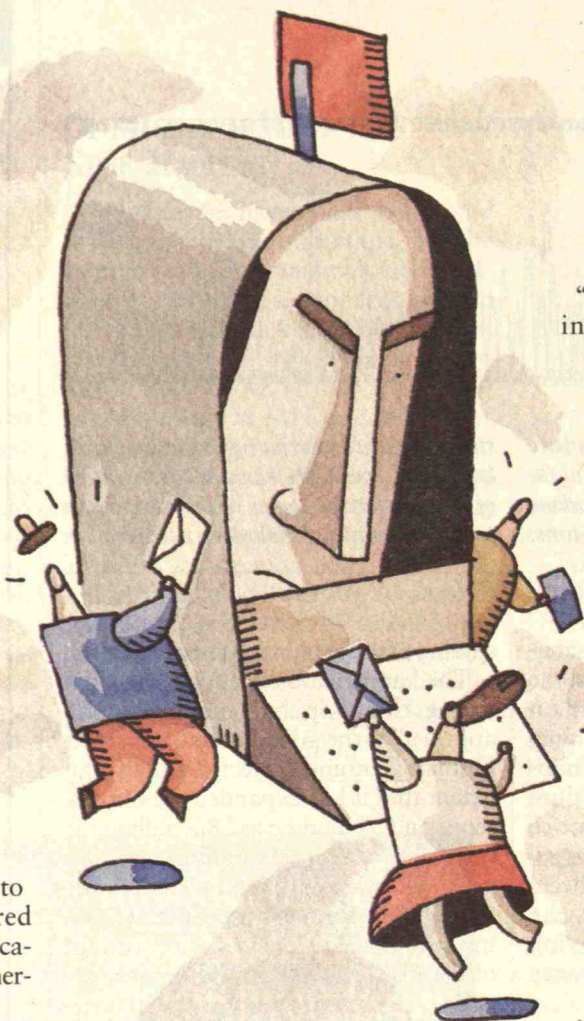
Foundation (EFF) to protect the civil liberties of computer users. "The ECPA dodged the whole issue of what kinds of rights abuses might take place within an organization," maintains Barlow. "It does not protect you from having your privacy invaded by the company you work for."

The EFF has taken the position that, at the very least, if a company is going to be accessing the e-mail of its employees, it needs to have a stated policy to that effect. "There's this assumption that because the company you work for owns the computer system, it somehow owns or has the right to access the e-mail," says Barlow. "But that's like saying that because the company owns the pen with which you wrote a letter, it owns the letter."

Michael Godwin, legal adviser for the EFF, points out that some employers who would never think of monitoring your telephone calls might not hesitate to monitor your electronic mail. "It's not only easier, it's easier to justify, at least psychologically," he observes. "When a company has poured a lot of capital into an office computer network, bosses may feel they have the right to this sort of access."

Encryption Embargo

Some point to data encryption as the ultimate solution to the problem. "Right now," says Barlow, "it's possible to encrypt data so securely that all the supercomputers at the National Security Agency could try for years and still not decode the information." But that's exactly why the NSA, and the FBI, don't want the most powerful encryption capabilities to be widely available. If everyone could encrypt their electronic communications, the government would have no way to peek



over someone's shoulder—for any reason, justified or not.

The EFF has been working to persuade the government to drop restrictions on the use of encryption technologies. In fact, Barlow doesn't believe the government has any choice: "It's like trying to embargo the wind...whether the NSA relaxes its restrictions or not, people are going to start using encryption."

In the meantime, e-mail privacy remains an unresolved labor issue. Thus, the Electronic Mail Association has published a "tool kit" guide to help employers formulate company e-mail policies. "In some instances it may be proper for an employer to monitor e-mail," says EMA executive director Michael Cavanagh, "if it has evidence of safety violations, illegal activity, racial discrimination, or sexual improprieties, for instance. Companies may also need access to business information, whether it is kept in an employee's drawer, file cabinet, or computer e-mail."

The key, says Cavanagh, is for employers to make their computer-privacy policies explicit: "Once employees have been told that under appropriate corporate circumstances their e-mail can be accessed," he says, "there is no privacy issue; they have been told what the policy is." Clearly, though, employers still have to be accountable for their privacy policies, and if employers do something unreasonable, he says, employees have the right to sue.

An explicit policy might be better than no policy at all, but attorney Noel Shipman expects that making guidelines clearer will simply convince employees that "they are trading their rights for their salaries." As a result, he expects even those with legitimate grievances to forego lawsuits.

But while Shipman acknowledges that losing in court has made him a little more sympathetic to just how complicated the issue is, he maintains his original position: "I don't think anyone should read anyone else's e-mail—that's the simple bottom line."

—DAVID BJERKLIE (*The author is a science reporter for Time magazine.*)

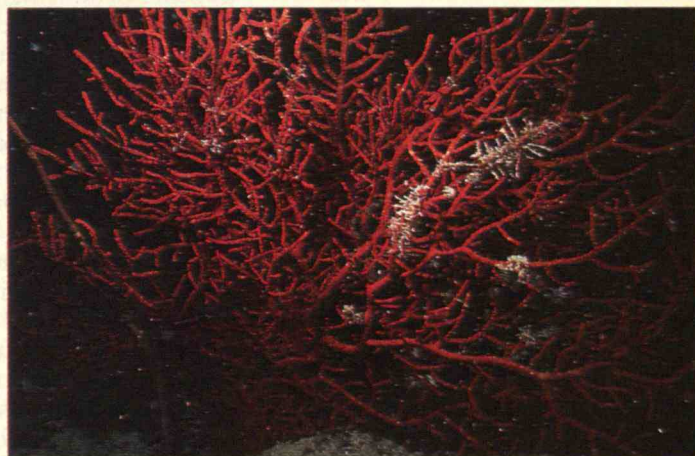
Pharmaceuticals from the Sea

In the public imagination, earth's oceans are a kind of watery desert punctuated by nomadic sea creatures and the occasional oasis-like coral reef. By contrast, most people think that tropical rainforests, with their lush foliage and myriad animal species, represent the pinnacle of biodiversity.

The truth is that the biodiversity of rain forests may actually pale in comparison with that of oceans, according to some researchers. "The ocean has enormous genetic diversity and is chemically rich," says William Fenical, an oceanographer at the University of California in San Diego. "But it has fewer spokespersons than the rainforest because while people walk around in the forest, they don't swim in the open ocean."

The second-class status of the seas is now poised for change, however, thanks

The sea fan, a brilliantly colored soft coral, is one of hundreds of marine species now being tested for anti-cancer activity. Researchers believe such invertebrates may contain powerful defensive substances since they have no natural predators.



largely to work by Fenical and others on the chemistry of marine organisms. In fact, marine algae, invertebrate animals, and microbes are the most probable source of the next generation of life-saving pharmaceuticals, these researchers believe.

Until now, terrestrial organisms—primarily soil bacteria and fungi—were the principle source of antibiotics and other medicines. But the search on land has reached a point of diminishing returns,

says Fenical. "Drug companies spend more than \$10 billion a year screening soil microbes for drugs, but there's nothing really new." The waning effectiveness of existing drugs, particularly against new strains of deadly diseases like tuberculosis, he adds, has made the need for alternative sources all the more imperative.

While exploring the ocean for potent new drugs seems like a relatively new field, David Newman, a chemist in the Natural Products Branch of the National Cancer Institute (NCI), notes that its origins can be traced back to Pliny the Elder, a Roman naturalist who reported that the sea hare, a shell-less mollusk from the Indian Ocean, had medicinal properties. But the advent of scuba gear and subsequent improvements in diving apparatus are making modern research possible.

In fact, virtually every major ocean is now under investigation by researchers from universities and oceanographic

institutes. Most collecting is done in tropical waters where species diversity is greatest. Small groups of researchers collect samples from areas rich in organisms and accessible to divers—the intertidal zones and the continental shelf out to the depths of 300 or 400 feet—although submersibles are occasionally used for deeper sampling.

At the Scripps Institution of Oceanography in San Diego, for example, Fenical and his team have been conducting a



The sea hare (top), a sluglike mollusk, contains a chemical with antitumor properties. Coral-like bryozoans (bottom) produce a compound that halts the growth of human leukemia cells and mouse lung tumors.

for antitumor and anti-AIDS activity.

To the uninitiated, searching for useful molecules among a bewildering array of organisms might seem like an exercise in futility. But, explains Fenical, "Natural products are 100 to 1,000 times more likely to have biological effects than something cooked up in a laboratory. Evolution has created compounds that bind to proteins, confer chemical defenses, or function in communication," he says. "It's up to researchers to find other uses for these compounds."

One such compound, didemnin B, first isolated from a Caribbean sea squirt in 1978, has shown activity against melanoma, leukemia, and several other kinds of malignancies. Research indicates that the drug works partly by inhibiting protein synthesis and, to a lesser extent, DNA and RNA synthesis, processes central to cancer cell growth and proliferation.

Bryostatins, extracted from tiny coral-like animals known as bryozoans, are another promising group of marine chemicals. Research with mice has shown that bryostatins limit the spread of certain lung tumors. And in test-tube experiments, bryostatins inhibit the growth of human leukemia cells.

Other compounds that have demonstrated antitumor properties include dolastin—extracted from the sea hare described by Pliny the Elder—as well as chemicals from a Pacific sea sponge and a Philippine red alga.

Despite its enormous potential, research on marine natural products faces a number of obstacles. One is simply a lack of collection biologists who are also skilled at working in marine environments. "One reason we know so much about terrestrial organisms," says Fenical, "is because the drug industry paid for people to learn about them." But that's not the case with marine research, he says.

In fact, the greatest impediment is the reluctance of drug companies to fund research on a large scale. "They are apprehensive about being so far removed from the source of natural products," Fenical explains. "They are

used to maintaining control over the entire process," he says. "And they worry about the unknowns, such as whether they will run into resistance if they want to harvest some beautiful species of invertebrate."

Companies are also concerned about the heretofore minimal return on investment. Robert Schwartz, a natural products chemist at Merck, contends that while there is "cautious optimism" about marine sources, it is tempered by years of prior effort that has failed to yield marketable results.

Collection Collaborations

One effort that is helping reduce the caution is being sponsored by NCI's National Cooperative Drug Discovery Group (NCDDG). Of the group's seven major programs devoted to natural products research, two—at Bristol-Myers Squibb and Syntex—are devoted exclusively to marine products.

These programs are aimed at forming alliances between academic researchers who have many years of experience in both marine collection and classification and pharmaceutical industries that have resources to screen large numbers of chemicals for effectiveness against a broad range of diseases. According to program director Matthew Suffness, the collaborations are paying off. "Since the two marine programs were first established in 1989, investigators have identified as many as 80 compounds that show some activity against cancer, 20 percent of which have never been identified before."

William Fenical, whose work at Scripps is part of an NCDDG-supported collaboration between four universities and Bristol-Myers Squibb, believes such efforts are increasing industrial interest considerably. "Over the past few years nearly every drug company in the United States and the major ones in other developed countries are moving toward marine work," he says. "There have been enough discoveries now that they are saying 'we have to get into this.'"

—TRACEY COHEN

The New(er) Math

The mathematics community has been under fire for decades as children in U.S. schools have been scoring progressively worse on international exams than students from other countries. Now, math teachers have launched their counterattack, a provocative hands-on teaching method explained in a report called *Measuring Up*, which caps a three-year effort led by the National Research Council's Mathematical Sciences Education Board (MSEB).

The approach represents a radical departure from traditional schooling. Most current math programs teach students only what they need to know to pass national tests, says Mary Lindquist, president of the National Council of Teachers of Mathematics. Unfortunately, according to a recent National Science Foundation study, these tests don't assess the basic techniques for applying math concepts to real-life experiences, which is essential for a true understanding of mathematics.

Most exams merely test rote memorization, says Nancy Cole, executive vice-president of the Educational Testing Service in Princeton, N.J., and one of the MSEB's chairs. If students are taught to calculate the average of several

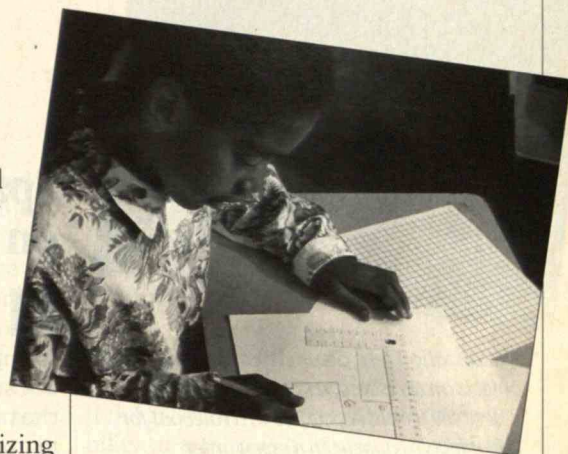
numbers, for example, the typical exam simply asks them to repeat the operation.

To address this shortcoming, the MSEB convened 20 educators, teachers, and mathematicians to draft a new set of exercises that teach elementary- and middle-school students a broad range of fundamental skills such as organizing data, finding patterns, applying familiar concepts to unfamiliar settings, visualizing objects from different viewpoints, and communicating results.

To teach averages, one fourth-grade exercise asks groups of classmates to count the number of buttons on each person's clothing. A worksheet asks them to list their findings in some orderly way, to estimate how many buttons are sported by the entire class, to figure out which number of buttons is most common, and to explain how they arrived at their answers. Other exercises involve such tasks as comparing the characteristics of grizzly bears and black bears, and using a computer to design a quilt. Instead of adding columns of numbers, students analyze the results of a class-wide checkers tournament, or find the patterns in bridge spans they build with rods of different colors and sizes.

Questions accompanying each exercise increase in difficulty, thereby enabling less-advanced children to get started while challenging more sophisticated children. Ranking the questions also allows teachers to quickly assess how much each student understands.

Jacqueline Goodloe, a teacher at the Burrville Elementary School in Washington, D.C., and a member of the MSEB, has introduced the exercises at her school of 560 students. "The teachers are excited about doing hands-on instruction but are anxious about how to make assessments," she says. "They are mindful of parents, who always ask 'Is my child doing 'A' work, or 'B' work, or what?' They are also aware of principals who want to know how the school's children stack up



Designed to test how quickly students grasp new concepts, this exercise asks them to draw several versions of a new geometric figure called a "bexright," a six-sided object in which each pair of sides is perpendicular.

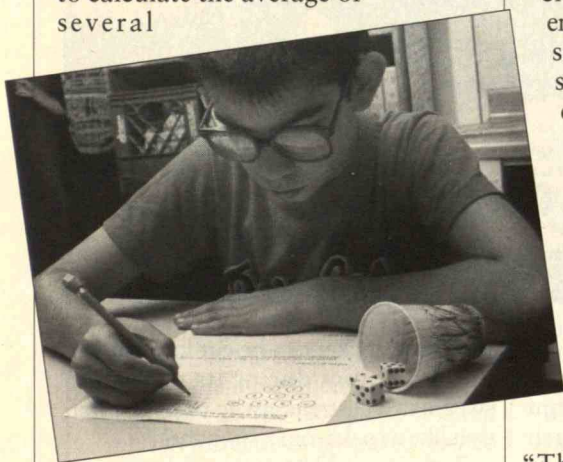
against others." Principals and school districts, in turn, are mindful of government officials at all levels who have long pushed for standardized tests as a means of monitoring course content and student performance.

The teachers' text for the exercises does explain how to categorize student responses as indicating high, medium, and low levels of understanding and includes responses written by children who took part in pilot tests. Still, Goodloe believes that more work is required to develop a universal standard against which to compare all students.

Getting Hooked

Nancy Cole foresees other potential resistance. For instance, several exercises call for special equipment, such as building materials and computers, and require more time of teachers, who must evaluate extensive, written answers. She adds that some teachers are not comfortable with the group work that many of the exercises entail. "They fear it'll create anarchy in the classroom," she says. But once they try it, she notes, "teachers get hooked. They're amazed at the sudden interest students have in math. And they see in children skills they never realized were there."

Cole's dream that textbook publishers and states will begin to change their teaching materials to reflect MSEB's voluntary approach is already coming true



In a novel arithmetic task, a student tosses three dice and makes as many integers as possible from 1 to 10 by adding, subtracting, multiplying, and dividing the numbers on the dice.



Visualization test: Given a map showing three objects on an island, a student must show where she would have to be in a rowboat for the objects to appear in a given order.

in several jurisdictions. Vermont's Department of Education has drafted materials for grades 4 and 8, as part of its Vermont Portfolio Assessment Program. One of its eighth-grade exercises reads: "You and a friend read in the newspaper that 7 percent of all Americans eat at McDonald's each day! Your friend says, 'That's impossible.' You know that there are approximately 250,000,000 Americans and 9,000 McDonald's restaurants in the United States. Convince your friend (in writing) that the statistic is possible."

On a national level, the Educational Testing Service has produced Packets, a set of supplementary instructional materials for the middle-school years that reflects MSEB goals. And the College Board in New York City, together with ETS, has produced Pacesetter, coursework that teaches high school students advanced concepts, such as the development of mathematical models.

Finally, there is now a major effort under way to establish standards for determining students' math proficiency under the new approach. The New Standards Project, run by the University of Pittsburgh, is a privately funded effort involving hundreds of volunteer teachers, school-board members, and public officials from 17 states to develop national benchmarks in math, science, and English for grades 4, 8, and 10. Instead of filling in dots on a multiple-choice exam with a number 2 pencil, the proposed standards will involve timed exams that, like the *Measuring Up* program, require students to solve real-life tasks and explain their thinking in writing.—MARK FISCHETTI

Spaceflight on a Shoestring

When a Delta II rocket launches a military satellite into orbit this spring, tucked away in its second-stage booster will be a small NASA payload that could pioneer a new means of propulsion for outer space. After the booster is jettisoned in orbit, ground controllers will command it to unfurl a 12-mile-long synthetic tether the thickness of dental floss.

Called the Small Expendable Deployer System, or SEDS, the system will trigger a spring to propel a 57-pound metal case at the tether's end down from the massive booster rocket at about 5 feet per second. Because of orbital mechanics, the case will swing ahead of the booster until it draws the line taut and begins swinging like a pendulum. The case will then dangle some 400 miles above the earth until it is cut loose precisely when its trajectory will send it back into the atmosphere at a specific point over the coast of western Mexico. Though the case will burn up as it reenters the atmosphere, heat shields could enable future payloads to reach the earth's surface.

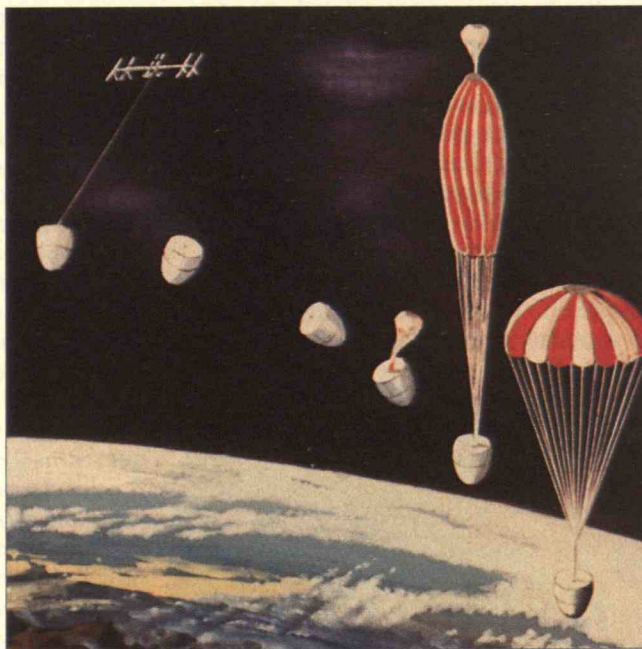
With the test, which will cost NASA some \$4 million, engineers hope to demonstrate the utility of high-strength tethers for returning objects from space, primarily from the space station. With this approach hardware or space junk could be lowered from the station to earth, saving rocket fuel on return flights.

Instruments could also hang by tether from the space station to study upper

extremities of the atmosphere, which are difficult to reach with weather balloons and orbiting satellites. As an object is projected toward earth, the craft or space station would receive an equal push in the opposite direction. This would counter the drag on the space station from the wispy reaches of the outer atmosphere that eventually would pull it out of orbit.

Tethers further offer a means of raising satellites into higher orbit and launching probes to other planets. If a craft dangling from a rapidly orbiting

Payloads from the space station could one day be lowered into the atmosphere on super-strong synthetic tethers and then parachuted to earth, thus saving the rocket fuel normally used for return flights.



shuttle or rocket can be cut loose at just the right point during its pendulum sweep, it will streak away to its destination like a rock from a sling shot.

Tethers could even be used to create artificial gravity. The centrifugal force created by spinning any spacecraft could be used to simulate gravity along the outer walls of any spacecraft. Unfortu-

nately, most spacecraft are too small to make this practical: they would have to rotate so fast to create the necessary force that astronauts would get dizzy and eventually pass out. But tying two capsules together with a tether several hundred yards long and spinning them end over end would reduce the speed of rotation required to simulate gravity so that the motion would feel normal. Such a configuration would enable astronauts to exercise in normal gravity to maintain muscle tone during long space flights, such as the planned mission to Mars.

Much of the recent history of tethers can be traced to Guiseppe Colombo, an Italian physicist who had trumpeted their potential since the early 1970s. An earlier attempt to use a tether in space—inspired by Colombo—failed last August when an Italian satellite attached

to the space shuttle Atlantis developed a snag after only 800 feet of its 12.5-mile-long tether was unfurled.

Polyethylene and a derivative of Kevlar, which is used in bullet-proof vests, are the most common tether materials. When used in thicknesses of less than one-quarter inch, these materials break before a typical satellite, for example, could be swung fast enough to attain a higher orbit. But increasing the thickness makes the tethers too weighty to be efficient. Thus, NASA engineers point to the need for lighter, thinner, stronger materials.

Current tether materials were developed only within the last decade, without benefit of demand from a full-fledged space-tether program. NASA was preoccupied with the space shuttle program, says Christopher Rupp, a

NASA engineer and chair of the agency's Tether Applications in Space Planning Group. If successful, upcoming experiments could in turn spur development of new materials, he believes.

One Step Beyond

If the growing optimism about the feasibility of tethers is borne out, low-earth orbit might someday be intertwined with tethered satellites and probes, resembling a stage of marionettes dangling from strings. In fact, other tether experiments are in the works. For example, a Delta launch scheduled for later this year is expected to carry a payload that will hurl a small student-built satellite into higher orbit.

Also, in May, another Delta rocket is scheduled to deploy a 1,600-foot copper

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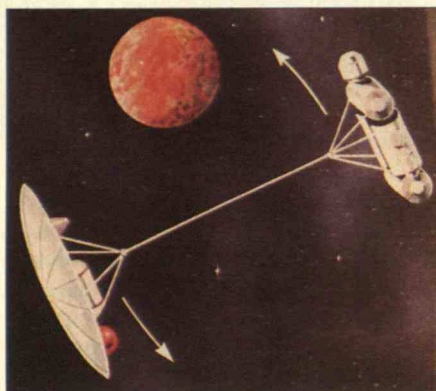
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The centrifugal force created by stringing two spaceships together and spinning them end over end would simulate gravity in each craft so astronauts could exercise normally to maintain muscle tone during long flights.

wire and drag it through the earth's magnetic field in an attempt to generate electricity—a concept last year's Italian tether experiment was designed to test. Although the technology is unproven, electrons should flow up the tether as it sweeps through the magnetic field, creating an electric current. Such a tether, says James Arnold, a planetary scientist at the University of California, San Diego, might provide power to a space station to augment the conventional supply from solar panels.

A good starting point for future research, Arnold suggests, would be to place one of the shuttle's massive 20-ton external fuel tanks into orbit with an assortment of tethered packages stowed between the two huge inside chambers. Only a small amount of additional energy would be required to carry the tank into orbit, he says, where it could serve as a steady platform for tether testing as well as an "energy deposit" for transferring momentum to the payloads.

With their low-tech elegance, Arnold believes, tethers might even open the door to a renaissance in space by making research more affordable to entrepreneurs independent of NASA.

—DAVID GRAHAM (*The author is a science writer for the San Diego Union-Tribune.*)

Field of Worms

Imagine a device that transforms organic garbage into a nutrient-rich fertilizer, conserves dwindling landfill space, and is only five inches long. A technological breakthrough? Hardly. It is as old as the hills and as plain as dirt: the earthworm.

Feed a garbage diet to a few thousand earthworms—red worms are best—and they will digest it and excrete what is euphemistically known as worm castings. The castings, naturally laden with nitrogen, make a potent food for plants and lawns.

The process is called vermicomposting. Until now it has been practiced on only a small scale, such as in a worm box that consumes a family's table scraps. But a handful of vermicomposting advocates believe the earthworm can play a loftier—and profitable—role in addressing the landfill shortage. They are targeting California cities and counties, which are scrambling to comply with a tough state mandate to halve landfill wastes by the year 2000.

Vermicomposting is often associated with traditional composting, a technique that several municipalities have embraced. But the two are not similar. Composting relies on microorganisms and mechanical aeration to hasten the natural decomposition of organic material. Vermicomposting obviously uses different sorts of critters, and doesn't require the expensive earth-moving machinery needed to maintain compost heaps. The only equipment needed is a pulverizer that reduces the waste to small enough pieces for the earthworms to digest.

Moreover, worm castings make better fertilizer than compost, which is best used as a soil replacement. "Final, cured compost is not all that high in available nitrogen, which is often the measure of a material's fertilizing ability," says Jeffrey Hunts, a composting specialist at the California Integrated Waste Management Board. "Good compost, and I mean good, is 1 to 2 percent nitrogen. Worm castings tend to be significantly

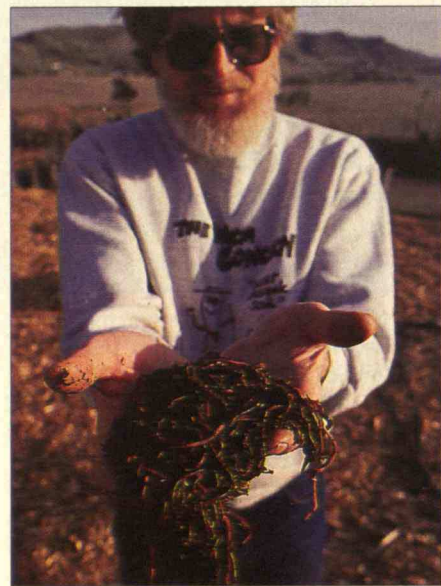
higher in nitrogen, with about 3 to 5 percent."

The leading advocate for vermicomposting is Richard Morhar, an accountant who gave up tax returns for earthworms. A self-professed "worm wrangler," he is founder of the Worm Concern, a 16-acre vermicomposting operation now based in the southern California city of Simi Valley.

The unglamorous Worm Concern site, which lies in the shadow of the Ronald Reagan Presidential Library, is frequented every day by garbage trucks filled with yard waste from homes in Simi Valley and Thousand Oaks. Both cities, with populations exceeding 100,000, are running pilot programs in selected neighborhoods that, if successful, could establish vermicomposting as a practical waste-disposal alternative. Grass clippings, tree trimmings, dead leaves, and other yard waste account for one-fourth of the residential garbage in Simi Valley and as much as 40 percent of that in Thousand Oaks.

Simi Valley's program has been so

"Worm wrangler" Richard Morhar, founder of a novel composting operation, shows off a few of his business partners—red earthworms, which transform waste into rich soil additive.



The worms digest pulverized yard waste (left) and excrete castings (right) that contain at least twice as much nitrogen as normal compost.



successful that the City Council will expand it throughout the city this fall. Under a full-fledged program, Simi Valley will divert 800 tons of yard waste—some 5 percent of the city's total waste production—to the Worm Concern every month. "It's going to be a big boost in meeting the state mandate," according to Patrick Pieres, acting deputy director of environmental services for Simi Valley. "People really like the program," he says, adding that most residents are willing to pay the extra \$2.25 per month to cover the cost of separating yard waste.

Thousand Oaks residents also praise their city's program, which sends 20 to 24 tons of waste to composting every week, says waste planner Carolyn Greene. But because many residents say they don't want to pay more for it, city officials have not decided on the program's future.

An Expanded Role

Still, state officials say the potential for vermicomposting is vast. "I don't see why worms could not be used on a wider scale," says Hunts of the California Integrated Waste Management Board, which regulates landfills. In 1990, according to the board, yard waste accounted for more than 6 million of the 44 million tons of garbage generated by Californians. But more than 90 percent of the material went straight into landfills.

Yard waste is only one component of the waste stream that worms find palatable. In Fallbrook, a community of 22,000 about 50 miles north of San Diego, the Sanitation Department has made money by feeding partially composted sewage sludge to worms and selling the castings at local nurseries under the brand name Vermigro.

"It started as a pilot project and got to be a profitable project," says Michael Page, supervisor of the Fallbrook Sanitary District. After six years of trial and error, Page says, annual sales of worm castings reached \$150,000. More important, the district avoided dumping any sludge in landfills.

Unfortunately, an air-pollution control board shut down the district's worm farm in December because nearby residents complained about its earthy odors. Yet despite the setback, Page still advocates worm composting. "I think it has a major niche," he says. "The only real concern is to make sure that vermicomposting sites are far removed from developed areas."

In fact, Page notes that several sanitation districts in San Diego County have agreed to build a jointly operated sludge vermicomposting facility. Regulatory approvals may take three to five years, though, because under state regulations the facility would have to follow the same approval process as a new landfill, requiring an environmental impact statement, public hearings, and approvals from state and local agencies.

Still, advocates believe that earthworms, which Aristotle once called the "intestines of the earth," will eventually play a major role in helping to solve the garbage problem, and that this will reflect their already earned place of ecological honor. Consider what Charles Darwin had to say about them in his last book—*The Formation of Vegetable Mould Through the Action of Worms*—the culmination of 40 years of research on earthworms and their indispensable role in soil creation. "It may be doubted whether there are any other animals which have played so important a part in the history of the world as have these lowly organized creatures."

—DOUG MCCLELLAN

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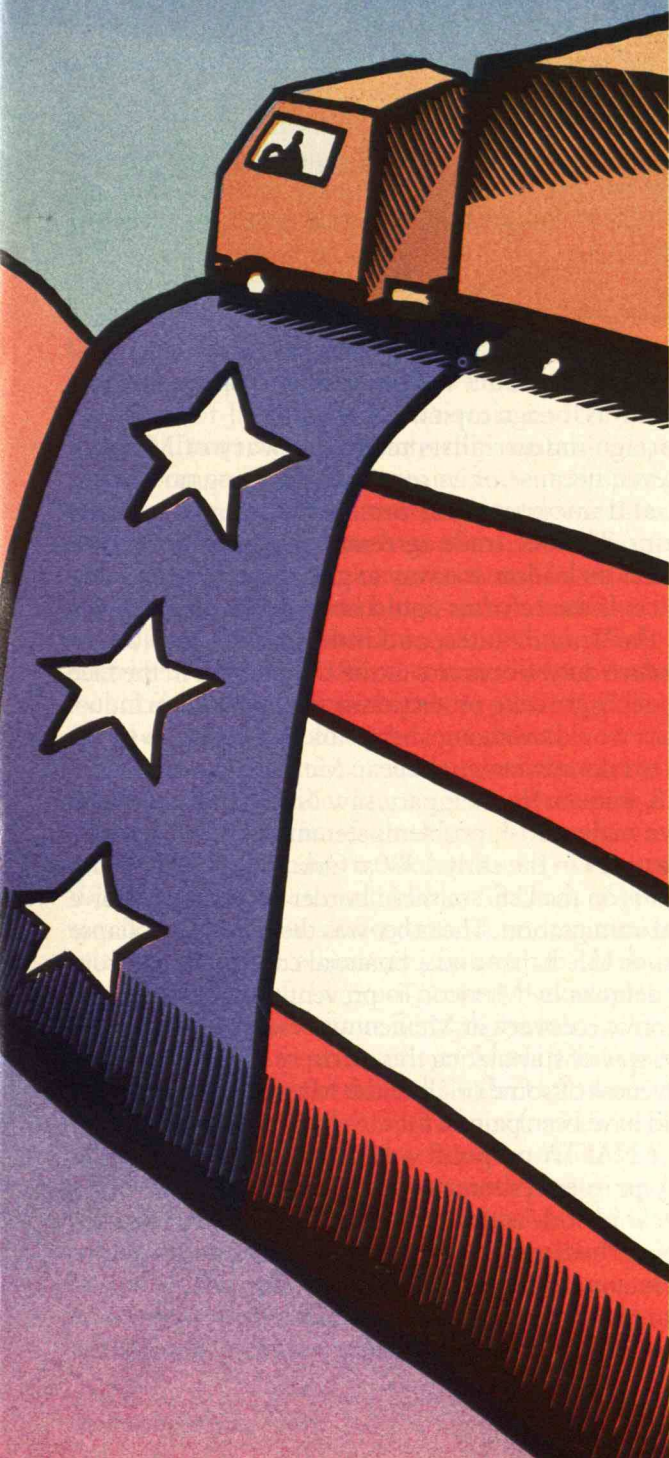


Making the Free Agreement

BY CLYDE PRESTOWITZ

THE PENDING TREATY TO FORGE A
NORTH AMERICAN TRADING BLOCK WILL HELP MEXICO
BUT HURT THE LONG-TERM INTERESTS OF THE
UNITED STATES. FIXES CAN HELP IT
SERVE ALL PARTIES.

e-Trade Work



THE North American Free Trade Agreement (NAFTA)—the pact to open the borders between the United States and Mexico to an unrestricted flow of goods—is a watershed in the history of U.S. economic negotiations. But a key challenge to Bill Clinton is to determine if NAFTA, signed in December by the countries' presidents and now awaiting ratification, is as good for the United States as it is for Mexico, and if not how to make it so. (Canada, also a party to the treaty, signed on as an extension of its 1990 free-trade agreement with the United States.)

Clinton has already indicated that he wants to strengthen efforts to clean up industrial pollution along the U.S.-Mexican border, and he plans to seek some improvement in worker assistance, since the treaty may result not only in some job dislocation but in a significant amount of long-term job loss. But the president should ask for more to ensure that NAFTA does not hurt the long-term interests of the United States.

An Ideal Solution

Ever since World War II, U.S. presidents have subordinated economic interests to military and diplomatic concerns, making unilateral trade concessions to obtain favorable U.N. votes and help on projects such as rights to foreign bases. The combination of overwhelming U.S. economic superiority in the immediate postwar period and the Soviet threat made this an easy and logical policy in the late 1940s and 1950s. That it has persisted up to the present is evident from the fact that during the Gulf War, one of Washington's first policy decisions was to relax the U.S. quota on textile imports from Turkey to persuade that country to join the anti-Iraq coalition. The potential impact of this decision on U.S. workers and the national trade deficit was given only minor, if any, consideration.

The neoclassical theory of international trade has supported this focus. As presently expounded in the United States, this theory holds that geopolitical concessions are not really concessions because they entail no costs, since what a nation makes is of little significance as long as it makes *something*. In the words of one of President Bush's economic advisers, "Potato chips, computer chips, what's the difference? They're all chips." If it doesn't matter what a nation makes, then it doesn't matter what it trades either—logs or scrap aluminum are the equivalent of airplanes and supercomputers. U.S. negotiators have therefore always strived to create open markets in the world trading system, assuming that freer trade would automatically benefit both the U.S. economy and its partners. It is with this historical and philosophical perspective that U.S. leaders confronted the looming problem of Mexico in the late 1980s.

The Mexican crisis was rooted in the oil boom of the 1970s. With revenues rising from soaring oil prices and exports, Mexico redoubled earlier efforts to diversify its economy and transform itself from a Third World exporter of raw materials into an industrial power. For a time it seemed that oil wealth would make this possible while allowing Mexico to leave in place formidable trade barriers, inefficient state-owned enterprises, and massive subsidies to various parts of the economy.

The collapse of oil prices, rising international interest rates, and widespread mismanagement and corruption ended this dream as Mexico fell into receivership in 1982. The debt crisis forced dramatic reforms, such as privatizing state industries, that produced impressive gains on both the trade and industrialization fronts. But it was clear to Mexican leaders that a yawning investment gap still remained. Because not enough domestic



IF MEXICO BECOMES A THAILAND-LIKE EXPORT BASE FOR OTHER COUNTRIES, ASSEMBLING COMPONENTS FOR FINAL SHIPMENT TO THE U.S., THE RESULT MIGHT BE GOOD FOR MEXICO BUT VERY BAD FOR THE U.S.

savings were available to fund new enterprises, the only answer was foreign capital.

Foreign industrialists remained wary of Mexico, however, because of its record of reneging on foreign debt and uncertainty about the permanence of the reforms. The free-trade agreement was thus conceived by Mexican leaders as a way to give these investors confidence. If the reforms could be enmeshed in a treaty with the United States, and if that treaty would also guarantee duty-free access to the U.S. market in the face of possibly growing protectionist sentiment, then industrialists would overcome their fears and decide to set up shop to take advantage of cheap Mexican labor.

U.S. leaders, for their part, saw NAFTA as a solution to two nightmarish problems stemming from Mexico's bankruptcy in the early 1980s. One was the possibility of chaos on the U.S. southern border caused by massive illegal immigration. The other was the potential collapse of major U.S. banks and a financial crisis resulting from loan defaults by Mexico. To prevent the first outcome, economic recovery in Mexico was essential. The most direct way of stimulating this recovery would have been forgiveness of some or all of the Mexican debt, but this would have been painful for U.S. banks.

The NAFTA proposal was thus welcomed as a relatively painless panacea. The idea was that through closer trade ties with the United States, Mexico would simply grow its way out of its problems at no cost to Americans. U.S. markets for Mexican goods would expand as a result of lower trade barriers, and this in turn would attract the outside investment Mexico des-

CLYDE PRESTOWITZ is president of the Economic Strategy Institute, in Washington, D.C. A former trade negotiator, he is the author of *Trading Places: How We Allowed Japan to Take the Lead* (Basic Books, 1988) and *The New North American Order* (University Presses of America, 1991).

perately needed to recharge its economic batteries. Mexico's growth would allow it to repay its debt and at the same time raise real wages, producing a stable and prosperous country increasingly inclined to democracy. Growth in Mexico would also create new markets for U.S. exports, thereby stimulating the U.S. economy. Any costs of a free-trade agreement would be small and primarily entail movement of low-wage, labor-intensive industries south of the border—the high-wage, high-productivity work would stay in the United States. All in all, the trade agreement seemed an ideal solution.

The Last Thing the U.S. Needs

In fact, there was a problem: the proposed treaty came at a time of fundamental change in the international economy. Not only was the United States no longer economically dominant in the late 1980s, but it had a chronic \$100 billion trade deficit and was experiencing competitive difficulties that called into question the underpinnings of its postwar economic policy.

Two ideas were becoming especially clear. One was that market-oriented capitalism comes in more than one variety. American-style capitalism, with its emphasis on laissez-faire and an arm's-length relationship between industry and government, was being challenged by the successes of Japan, Korea, Taiwan, and Singapore, which did not accept the potato-chips-equals-computer-chips doctrine. These countries instead emphasized government support of business and international leadership in key industries such as autos, electronics, and steel. This strategy held that an economy based on high-growth, high-value-added, high-tech industries is likely to be richer than one based on commodities. Under this doctrine, reducing tariffs on commodities in exchange for similar reductions on highly processed goods produced elsewhere would not be a good deal.

The second revelation, linked to the first, was that the neoclassical notion that low wages in developing countries are primarily the result of low productivity is not necessarily true. Studies by Walter Russell Mead, of the World Policy Institute, and Harley Shaiken, of the University of California, showed that developing countries usually close the productivity gap much faster than the wage gap. One of the most powerful examples was Mexico itself, where some auto plants were achieving 85 percent of U.S. productivity levels while paying wages only 6 percent of those in similar U.S. plants.

These facts had grave implications for U.S. negotiators, who had assumed that Mexico would supply largely low-end, labor-intensive goods to the new integrated North American market. But Mexico was, in fact, determined to change these patterns. President Carlos Salinas maintained that his country was seeking investment particularly for high-value-added export industries, and Finance Minister Pedro Aspe Armella

noted that “today economies of scale and technology are what drive trade.”

This meant that U.S. and Mexican goals were not necessarily congruent. It was in Mexico's interest to become another Taiwan or Thailand—a platform for the manufacture and assembly of goods for export to the United States. But the last thing the U.S. needed was another offshore platform pumping exports produced with low-cost, high-productivity labor into its market and further widening a trade deficit that was already a major drag on economic growth and employment. Thus in finalizing the deal, U.S. negotiators suddenly had to think carefully about how to assure favorable trade patterns for the United States while also stimulating growth in Mexico.

In pursuing such a strategic approach, U.S. officials were not particularly well served by the multitude of economic models constructed to estimate the impact of a free-trade agreement. At first, nearly all predicted a relatively small but positive impact on the United States and a larger (because of its smaller economy) positive impact on Mexico. However, many models ignored important determinants of trade flows such as domestic price controls, subsidies, and preferential credit for certain industries, and the models assumed full employment, stable exchange rates, and rational economic behavior based solely on changing prices. Many of the models were also static, meaning they estimated a one-time result from a particular action such as a tariff reduction, even though the long-term impacts of such moves are much more dynamic: they are based on con-



BY THE YEAR 2002, MEXICO MAY HAVE A TRADE SURPLUS
OF NEARLY \$10 BILLION WITH THE UNITED STATES. THE RESULT
COULD BE THE LOSS OF 150,000 U.S. JOBS.

tinuous adjustments to the effects of the change.

Most significantly, the vast majority of the models ignored the long-run impact of new foreign investment in Mexico even though that was the entire purpose of the agreement. Models that did account for such investment assumed that it would not displace funds that would otherwise flow to the United States, and that it would be spread evenly over all Mexican industries—this despite President Salinas's explicit strategy of concentrating on a few key export sectors. The upshot was that the models were not very useful, as the congressional Office of Technology Assessment noted in a 1992 report.

In an attempt to provide a more realistic view, the Economic Strategy Institute (ESI) created a model that anticipated changes in trade patterns as products manufactured in Mexico became more sophisticated. By 1991 Mexico was already attracting about \$3 billion annually in new foreign investment concentrated in several key industries, including autos, auto parts, consumer electronics, telecommunications equipment, and machinery. The country's stated objective was to double this rate of investment, primarily in those industries.

ESI examined two scenarios, one based on continuing the current level of investment and another on achieving the high level. Under the low-investment scenario, the United States gained a trade surplus with Mexico during the first five years, as falling trade barriers and growing Mexican imports of capital equipment produced a surge of U.S. exports. But new export-oriented production in Mexico soon produced a U.S. trade deficit that would grow to \$14 billion by the end of the century. The high-

investment scenario produced the same result, except that the U.S.-Mexico trade balance turned negative for the United States after four years and hit \$30 billion at the end of the century.

The only way to ensure long-term U.S. benefit, according to analyses assisted by the ESI model, was to negotiate a deal such that the bulk of new investment in Mexico would be North American, Mexican exports to the United States would largely displace products now imported from elsewhere, or a significant portion of Mexican production would be exported outside North America.

The Japanese relationship with Thailand provides an example of how this can work. Like the United States and Mexico, Japan and Thailand feature large differences in wages, standards of living, and overall development levels. Since 1985, Japan's annual investment in Thailand has jumped from \$100 million to over \$1 billion, with the seven-year total topping \$4 billion. This investment has led to dramatic increases in Thailand's trade volume, with imports soaring from \$8 billion annually to \$33 billion and exports climbing from \$7 billion to \$23 billion.

The pattern of this intense activity is noteworthy. While Thailand's trade deficit with Japan has expanded from \$1 billion to over \$5 billion in only four years, exports to the United States have grown from \$1.5 billion in 1986 to nearly \$4.5 billion. Because its U.S. imports have grown more slowly—from \$1 billion to just under \$3 billion—Thailand now has a \$1.5 billion trade surplus with the United States after posting a deficit as recently as 1984.

Japan sells capital equipment and components to Thailand while the latter receives new investment—an arrangement that creates jobs and economic growth in both countries. A similar deal between the United States and Mexico could likewise be advantageous to both. On the other hand, if Mexico becomes a Thailand-like export base for other countries, assembling Japanese and European components for final shipment to the U.S. market, the result might be good for Mexico but very bad for the United States.

Impact of the Deal

Before treaty negotiations began, the Economic Strategy Institute considered the latter situation likely. Since a major goal of NAFTA is to eliminate tariffs and other such barriers, Asian and European producers would ship sophisticated parts to Mexico, which would assemble them into finished goods and sell them duty-free to the United States, thereby hurting U.S. industry and making a serious dent in employment. Producers of television sets who assemble foreign-made components in Mexico for shipment to the United States could have eliminated 20,000 to 50,000 U.S. jobs, for example.



CLOSER TIES TO MEXICO THROUGH NAFTA COULD ASSURE
A SECURE U.S. OIL SUPPLY AT REASONABLE PRICES.

To prevent this, U.S. negotiators aimed to require that goods qualifying for reduced tariffs contain a minimum percentage of North American-made components. But Mexico wanted any such requirements to be modest, since they make life more difficult for foreign producers.

Under the agreement, goods entering the United States duty-free must have some North American content, but the amount varies with the industry. For example, only television sets with North American-made picture tubes will be eligible for reduced tariffs. Because such tubes are all made in the United States, this will help the U.S. industry. Chemicals and aircraft must include high North American content to qualify for NAFTA treatment, again favoring U.S. producers. On the other hand, computers and electronic products must contain only about 20 percent North American-made content to qualify. If such products simply replace similar goods already imported to the United States, the net impact on the U.S. economy will be neutral. But Asian and European manufacturers are more likely to see the treaty as an opportunity to ship different electronic goods to the United States through Mexico.

Textiles and clothing must be made of cloth produced in the region to qualify as North American, and some goods must even be made from fibers grown on the continent, favoring U.S. textile producers. But the agreement calls for the United States to immediately remove quotas on Mexican goods meeting these rules while gradually phasing out quotas even on those that do not. Thus the U.S. textile industry may achieve only modest gains and could even lose because of the demise of its major customer, the U.S. apparel industry, which will be forced to lay off workers as the United States begins to accept more clothing assembled in Mexico.

The U.S. auto industry may fare better, since vehicles will have to contain 62.5 percent North American content to receive NAFTA treatment. However, Mexico has long used industrial decrees to impose special rules that ensure a domestic auto industry, and the treaty retains some of these rules.

For example, the decrees have required automakers to produce in Mexico if they want to sell cars there, and Ford, Chrysler, and GM all have plants from which they serve the relatively small (600,000 vehicles in 1990) Mexican market. Mexico mandates that these companies export \$2.50 of autos for every \$1 they bring in, assuring itself a trade surplus in the industry and attracting investment that might otherwise be made in the United States.

U.S. automakers and parts producers hoped that NAFTA would immediately eliminate all such requirements for North American firms, but the rules will diminish only gradually for all producers. U.S. industry also wanted to stipulate that Asian and European automakers export some Mexican production outside the continent, but the treaty contains no such provision.



THE EUROPEAN COMMUNITY HAS CREATED COMMON SOCIAL, LABOR, AND LEGAL STANDARDS. FOR THE WELL-BEING AND DIGNITY OF ALL THEIR CITIZENS, THE U.S., MEXICO, AND CANADA WOULD BE WISE TO DO THE SAME.

Finally, automakers operating in Mexico must use about 33 percent Mexican parts and boost this percentage as they import more cars and parts into the country, hurting U.S. parts producers.

In general, NAFTA will phase out tariffs and quotas gradually over 10 to 15 years, depending on the industry. Because Mexican tariffs and quotas are much higher and more numerous than those of the United States, this favors businesses operating in Mexico and promises to increase the U.S. trade deficit. For example, the Vitros Group of Monterrey is one of the world's leading glass producers, aided by low-cost energy and a near-monopoly in the Mexican market. Since Mexico's high tariffs on glass will be reduced over 10 years while U.S. tariffs are already low, Vitros will gain market share in the United States at the expense of U.S. producers.

These complex and somewhat arcane rules lead us to expect an overall U.S. gain of about \$1 billion during the first five years under NAFTA, with \$10.5 billion of new U.S. exports offsetting \$9.7 billion of new imports from Mexico. U.S. producers can expect to sell more telecommunications equipment, computers and computer software, pharmaceuticals, capital equipment, and tools in Mexico, creating 20,000 to 30,000 U.S. jobs. But Mexican exports resulting from investment in state-of-the-art auto and parts plants by Ford, Nissan,

Continued on page 31

Will Manufacturing Head South?

By Harley Shaiken

WINTER has been unusually grim this year in Cortland, N.Y., about a four-hour drive northwest of New York City. Overshadowing the usual talk of the weather and the condition of nearby ski slopes is the fact that Smith Corona, the venerable typewriter manufacturer and one of Cortland's largest employers, has announced that it is moving its operations to Tijuana, laying off about 850 workers directly and idling another 700 or so dependent on its output.

Smith Corona's painful decision, coming as the debate over the North America Free Trade Agreement (NAFTA) shifts into high gear, highlights some key questions concerning the impact of the treaty on workers, unions, and labor markets. Those questions are revealing the flaws in two common notions: that a natural fit exists between the high-tech, sophisticated U.S. economy and the low-tech, low-productivity Mexican economy; and that any jobs the U.S. loses to Mexico will be at the low end of the spectrum.

While many Americans consider Mexico an industrial backwater, the emerging reality is quite different: a new generation of high-tech Mexican plants in industries from computers to automobiles rival the productivity and quality levels of the best Japanese plants. Sony, for example, assembles color televisions in Tijuana using delicate state-of-the-art circuit board technology. The plant's performance is so strong that it has garnered Sony's worldwide quality award for several years running, and the company no longer compares warranty costs for sets assembled in Mexico with those for units made 40 miles north near San Diego.

Consider also Ford's \$500 million assembly and stamping complex in Hermosillo, about 160 miles south of the U.S. border. Three years after the plant began production in 1986, the Mercury Tracers rolling off its assembly line were the second-highest-quality subcompacts sold in the U.S. market, surpassing Toyota Corollas, Nissan Sentras, and other far-

better-known Japanese nameplates.

Admittedly, such plants are far from typical of Mexico's industrial base, much of which uses antiquated, low-productivity methods to serve the domestic market. But the high-tech plants do represent a powerful and growing ability to produce the most sophisticated manufactured goods. Mexico has become the third-largest exporter of passenger cars to the United States, trailing only Japan and Canada and shipping close to 360,000 units worldwide in 1991. Mexico's exports of automobile engines—among the most difficult units to manufacture because of close tolerances and the need

**RETAINING HIGH-WAGE
U.S. JOBS REQUIRES
A RISING TIDE FOR ALL
NORTH AMERICANS.**

for sophisticated production technologies—soared from \$30 million in 1980 to \$1.2 billion in 1991, and they promise to rise higher in the coming decade.

Such figures indicate the extent to which the U.S. and Mexican economies have already become integrated. In fact, trade between the two countries more than doubled between 1983 and 1991, growing from \$26 billion to \$65 billion. With or without NAFTA, this integration will undoubtedly continue. But the proposed treaty is both a powerful symbol that will speed integration and a statement about the terms under which it will occur.

One of the agreement's main goals is to guarantee a hospitable investment climate so that manufacturers will feel as comfortable building a plant in Michoacan as in Michigan. For example, the treaty allows foreign investors to own 100 percent of Mexican-based businesses (49 percent is the current limit in many industries) and expeditiously repatriate any profits to the

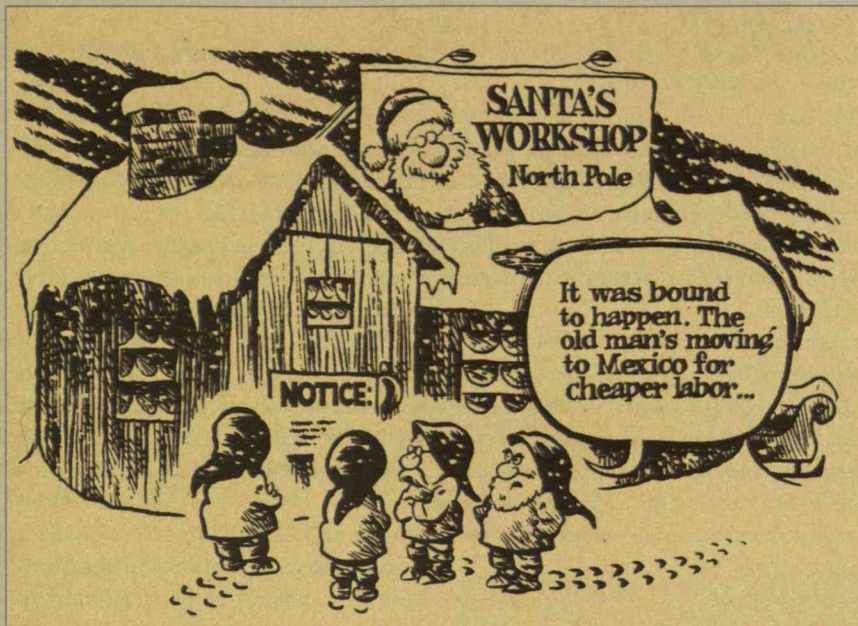
home country. Unfortunately, workers and unions have garnered no similar guarantees and face a bleaker future.

Much attention has centered on the total number of U.S. jobs that could be affected under the agreement, with estimates ranging from modest gains to a net loss of 500,000 jobs by the year 2000. Even proponents of the most optimistic scenarios admit that significant numbers of workers could be displaced from the positions they now hold. Lynn Martin, secretary of labor under George Bush, testified to Congress last summer that the agreement could cost 150,000 U.S. workers their jobs—the equivalent of two Chrysler corporations closing their doors.

However many workers are displaced, NAFTA could have a significant impact on the wages and working conditions of the jobs that remain. That's because Mexico's advanced industrial sector combines world-class productivity and quality with Third World wages and working conditions. Historically, the link between growing productivity and rising wages has allowed workers in the United States and elsewhere to move into the middle class. In Mexico, this link was either sluggish or nonexistent through most of the 1980s and into the 1990s. Surplus labor and low wages in Mexico's traditional sectors—agriculture, informal services, inefficient plants serving the domestic market—have depressed wages in the advanced export-oriented plants. The result is that Mexican autoworkers receive about one-eighth the compensation of their U.S. counterparts even though productivity and quality sometimes exceed U.S. levels.

Plummeting Mexican Wages

This situation reflects the lack of an independent labor movement as well as deliberate government policy. Mexico's "official" labor group, the *Confederación de Trabajadores Mexicanos* (CTM), is an arm of the ruling party and often serves more to transmit government decrees than to advocate for workers. The CTM



proved crucial in maintaining labor peace as real wages plummeted by 40 percent during the economically turbulent 1980s. The Mexican government, attempting to service Mexico's crushing debt, appease international financial institutions, and attract investment, implemented policies that served to cut wages and then held down increases as the economy began to recover. In fact, workers' earnings as a share of manufacturing value-added nose-dived from 44 percent in 1970 to 20 percent in the late 1980s.

Mexico's low wages could add to the significant downward pressure on U.S. wages already occurring as the United States integrates further into the global economy. "Until we get real wage levels down much closer to those of the Brazils and Koreas," Stanley J. Mihelick, Goodyear's executive vice-president for production, told the *New York Times* in the late 1980s, "we cannot pass along productivity gains to wages and still be competitive." Given such pressure, it is hardly surprising that U.S. workers have seen real earnings drop by 13 percent since 1969. The bottom end of the scale has fared even worse: wages for men without a high school diploma plummeted 23 percent between 1979 and 1991.

A 1992 *Wall Street Journal* poll confirmed that NAFTA could reinforce this trend, as one-quarter of 455 leading cor-

porate executives said they are either "very likely" or "somewhat likely" to use the treaty as a bargaining chip to hold down wages, and about 40 percent maintained that they may move at least some production to Mexico within the next several years. Indeed, in the early 1980s many large unionized U.S. companies sought to downplay their investments in Mexico; in the 1990s they take union leaders on tours of Mexican facilities.

Only a few plants need to relocate to produce a large demonstration effect. In 1987 Zenith's 1,600 remaining U.S. manufacturing workers in Springfield, Mo., accepted an 8.1 percent pay cut and a five-year contract, among other concessions, to avoid losing their jobs to Mexican workers. But even this was not enough: Zenith announced in late 1991 that it will move 1,000 more jobs south when its labor agreement expires in March 1993.

Some of the most highly paid blue-collar jobs in the U.S. economy may be affected, but lower-paid manufacturing jobs are hardly exempt. An \$11-an-hour Smith Corona worker makes the average for U.S. manufacturing but towers over the \$2-an-hour Tijuana employee. Thus a wide array of U.S. manufacturing sectors will undoubtedly accompany meat-packing, poultry processing, auto parts production, and other light manufacturing into the \$4-\$8 hourly wage range

previously the preserve of bottom-rung service jobs.

Because these trends come at a time of crisis for U.S. organized labor, the ability of collective bargaining to mediate them is limited. Unions now represent less than 12 percent of private-sector workers, down from 17 percent a decade ago and matched only in the early years of the Depression.

Under these circumstances, the pursuit of a high-skill, high-wage strategy will require more than simply strengthening U.S. worker training and unemployment assistance, important though these measures will be. Broad reform of labor law is also needed to help restore balance to the worker-management relationship so severely eroded during the past decade. Legislation prohibiting managers from permanently hiring replacement workers during strikes, and from intimidating employees during union campaigns, are two important examples. (A recent study by the Office of Technology Assessment, *U.S.-Mexico Trade: Pulling Together or Pulling Apart?*, reviews these and other options.) Still, such protections will mean little if companies can simply move to Mexico to avoid them.

Broader guarantees of the rights of Mexican workers, such as the ability to form independent unions and an international mechanism to ensure that these rights are enforced, are crucial. A continental minimum wage reflecting the new level of economic integration would also provide an important first step toward harmonizing wages upward rather than downward. Such measures would help restore the link between rising industrial productivity and wages, thereby expanding the consumer market on both sides of the border. The alternative is further social polarization and a declining standard of living throughout North America. ■

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NAFTA and the Environment

By Roberto Sánchez

Controversy over its potential environmental effects has dogged the North American Free Trade Agreement. Some environmental groups fear the treaty will provide a mechanism for bringing U.S. and Canadian environmental protection down to Mexican levels, and that freer trade will worsen the severe pollution along the U.S.-Mexican border as more industries locate there. Proponents of the treaty counter that accelerating economic growth will provide Mexico with the resources to strengthen its notoriously lax enforcement of environmental laws.

Given its strong stand on the environment, the Clinton administration is unlikely to allow the treaty to undermine U.S. standards, and Mexico will probably aim to raise its protection to the level of its new partners. Nevertheless, Mexico could suffer from uncontrolled growth, and environmental disputes could jeopardize the agreement itself, if the three countries fail to work together to strengthen Mexico's record.

Growing industrialization could worsen Mexico's already critical deficits in public services such as water supplies, sewage treatment, and solid-waste disposal. New investment could also mean more dumping of hazardous waste and worsening air and water pollution. U.S. industries with a high demand for water, including agriculture, electric utilities, aluminum, and steel, may move to Mexico to avoid higher prices and tightening U.S. regulations. These effects will concentrate in the border region at first but could expand to other parts of the country. U.S. and Canadian investors could also gain new access to natural resources in Mexico such as forests, fisheries, plant genetic material, and minerals without concern for long-term conservation or the people who depend on them.

In response to growing criticism of such possibilities, the United States and Mexico recently created the Border Integrated Environmental Plan (BIEP) to invest in sewage treatment plants, improve water supplies, and pave roads. Unfortunately,

by the time these services become available, more capacity will be needed. Nevertheless, the cooperation embodied in the plan could become a model for promoting wider environmental protection throughout Mexico.

Weak enforcement of environmental legislation has been a major concern in Mexico. The BIEP trains a handful of federal inspectors, but it should focus on creating a regional network of environmental workers. This is especially important because the Mexican government has been

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delegating some environmental protection to the states. Although decentralization is badly needed in such a large and diverse country, states and municipalities have not been given the resources they need to assume their new role.

A significant obstacle to improving environmental protection in Mexico is a lack of information about polluters, pollutants, and risks to local populations. Remediating this will require a massive effort by government, academia, community organizations, and the private sector to create regional, state, and local databases. BIEP should guarantee public access to these databases, since effective emergency planning is usually lacking; waiting for official instructions could prove deadly for communities that have not developed their own plans of action.

Trinational cooperation could help Mexico expand its environmental legislation. As of the end of 1992, Mexico's federal environmental agency (SEDESOL) had published only 81 environmental standards (the United States, by contrast, has promulgated hundreds). Dozens of other

rules are now being developed, mostly under contract with U.S. and Canadian consulting firms. Mexico has also followed a sectoral and reactive approach to managing its environment, attacking problems one by one only after they reach a critical stage. Although the border problems require immediate action, Mexico needs to establish incentives for pollution prevention and set clear penalties.

Although the BIEP does not now promote such efforts, Mexico, the United States, and Canada have proposed a North American initiative for the environment. Now only an idea, such an initiative could begin by establishing an agency to enforce environmental laws and finance protection in the border area. The agency would report to SEDESOL and the U.S. EPA but work closely with state and municipal governments as well as community and business groups. Establishing continent-wide guidelines for managing natural resources in accordance with social and environmental needs would be another important step. Finally, a trinational commission could establish uniform standards on hazardous exposures in workplaces and communities.

NAFTA now allows the three countries to maintain different environmental standards, stipulating that experts will mediate any disputes that occur. But differences in standards promise to fuel controversies already burning among U.S. businesses and communities that stand to lose jobs to Mexico.

Cooperation on standard setting can help reduce such disputes, but Mexico will need time to bring its laws in line with those of Canada and the United States. Meanwhile, it must retain the right to move slowly in areas such as secondary treatment of sewage, where the cost of compliance would divert valuable resources from more pressing social and economic priorities.

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and Volkswagen will offset a surge in U.S. auto sales to Mexico.

After five years the advantage will swing gradually to Mexico as U.S. plants move south to take advantage of lower wages in labor-intensive food industries such as poultry and processed meat. Mexico will also sell \$1 billion of new apparel, glass, vegetables and fruits, and petrochemicals to the United States. Finally, industry will buy more Mexican-made components and capital equipment as the Mexican economy continues to industrialize. By the year 2002, we estimate that Mexico will have a trade surplus of nearly \$10 billion with the United States, even if some of the products Mexico sells displace those now imported from Asia and Europe. The result will be a loss of 150,000 U.S. jobs.

Win-Win Recommendations

The good news is that these negative outcomes can be averted. Even in the early years under NAFTA, when the United States enjoys a trade surplus, job losses are unnecessary, especially in the textile and apparel industries. Because trade in these sectors is governed by a global system of bilateral quotas known as the Multi-fiber Agreement, the United States can offset Mexican imports by capping quotas from nations that already have large surpluses with the United States. This might even produce some gain in textile and apparel jobs.

The United States can also press aggressively for earlier cuts in Mexican tariffs and quotas, as NAFTA allows when both sides agree to such moves. There is no reason other than protectionism why restrictions can't be eliminated immediately in sectors such as flat glass.

Since the requirement that U.S. automakers increase their ratio of Mexican parts as they import more cars into Mexico could become a severe limitation and also divert investment from the United States, the U.S. should stipulate that these rules apply to only some Mexican imports, and that parts made by U.S. automakers in Mexico qualify. A similar understanding should be reached regarding "greenfield" provisions, which would enable a firm to include only 50 percent North American content when building a plant for a model or size vehicle it is not already manufacturing on the continent. Mexico should insist that any non-North American company include an engine plant as part of such investments to ensure a high degree of local production.

NAFTA members would benefit most if Mexico were to become a base from which North American industry could more easily penetrate other markets. To aid such exports, Canada and the United States might assist Mexico in building road and rail links between its east and west coasts (such links now run north-south) and in expanding its port facilities. NAFTA members could consult regularly and even establish goals for exports bound to other countries, and the U.S. Export/Import

Bank and U.S. embassies could offer credit and help to businesses shipping from Mexico to other destinations.

Mexico can grow as a market for U.S. exports only if domestic consumption expands rapidly, but such growth has been severely constrained by the Mexican debt crisis and tough fiscal reforms imposed by the International Monetary Fund. Debt relief from the United States would do as much if not more to stimulate the Mexican economy than a host of NAFTAs. The United States should redouble efforts to reduce the crushing weight of these loans by promoting debt-for-equity swaps and outright debt forgiveness, since most U.S. banks have by now written off the loans.

Energy has been largely excluded from the free-trade agreement, yet Mexico's inability to invest enough to expand oil production is a drag on growth. Closer ties to Mexico could assure a secure U.S. oil supply at reasonable prices. The United States should propose new talks aimed at inducing U.S. investment in Mexican oil fields in return for a guaranteed long-term supply.

The treaty stipulates that the signatories cannot undermine environmental laws in an effort to woo industry, but the agreement lacks specific means for enforcing this goal. Timetables, budgets, and a monitoring program for bringing the performance of plants operating along the U.S.-Mexican border up to par would be an important step. Bonds backed by the U.S., Canadian, and Mexican governments could fund a tri-national environmental agency that would conduct inspections, direct cleanup, and establish incentives for companies to invest in pollution-control equipment. (See "*NAFTA and the Environment*," page 30.)

In analyzing NAFTA, the Office of Technology Assessment concluded that "market forces alone are not likely to produce significant social and economic rewards" promised by free-trade proponents. In fact, low-wage competition could reduce U.S. living standards without accelerating development in Mexico (see "*Will Manufacturing Head South?*" on page 28). A U.S. commitment to maintain high-wage jobs by retraining displaced workers, certifying the skills of new workers, promoting closer links among U.S. firms, establishing a technology extension service, assisting exporters, and prohibiting bidding wars among local and state governments trying to recruit new industries is essential.

The United States could learn much in this regard from the European Community. Besides removing trade and investment barriers, the EC has established a central fund to help poorer nations such as Spain, Portugal, and Greece upgrade their infrastructure and the skills of their workers. The EC has also created common social, labor, and legal standards to prevent countries from using differences in such regulations to compete for industry. The United States, Mexico, and Canada would be wise to move in the same direction. ■

Ending the Scourge of Chemical Weapons

BY JAY BRIN

THE WORLD
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AFTER more than 20 years of arduous negotiations, representatives from 131 countries gathered in Paris in January to sign a treaty banning the development, production, and transfer to other countries of chemical-warfare agents and their means of delivery. The treaty—called the Chemical Weapons Convention, or CWC—complements the more limited Geneva Protocol of 1925, which bans the use of toxic chemicals in warfare. When the CWC enters into force in about two years, it will prohibit the manufacture for military purposes of lethal chemicals such as sulfur mustard, which causes painful skin blistering and lung damage, and nerve agents, which cause rapid death by interfering with the transmission of nerve impulses. The goal is to eliminate from the earth this particularly inhumane form of warfare.

The ban on chemical weapons will fill a gaping hole in international law governing weapons of mass destruction. It will supplement earlier treaties designed to limit the spread of nuclear weapons and to eliminate biological weapons (disease-causing microorganisms) and toxin weapons (poisons



produced naturally by microbes, plants, and animals).

Only the United States, Russia, and Iraq have admitted that they have chemical weapons. The sole large-scale use of such weapons in recent decades occurred during the Iran-Iraq war, when Iraqi mustard and nerve agents killed or injured some 45,000 people, including thousands of civilians. According to congressional testimony by U.S. intelligence officials, however, roughly 20 countries are believed to possess or be actively pursuing a chemical-warfare capability, including Burma, China, Egypt, India, Iran, Israel, Libya, North Korea, Pakistan, South Korea, Syria, Taiwan, and Vietnam.

The CWC will not go into effect until six months after the 65th country has ratified it, and in any case no sooner than 1995. But it is likely to take another 5 to 10 years before the machinery to implement the treaty is operating smoothly. The biggest hurdle will be hammering out the technical details of the treaty's verification procedures, which are the most comprehensive and intrusive ever established for any arms-control agreement.

Treaty participants will also need to create a brand new international agency—the Organization for the Prohibition of Chemical Weapons (OPCW)—to oversee the ban. This agency, to be based in The Hague, is expected to employ between 750 and 1,000 international civil servants. Like the Vienna-based International Atomic Energy Agency, which inspects civilian nuclear plants to prevent the diversion of uranium or plutonium to nuclear weapons, the OPCW will rely heavily on on-site inspection. But the agency's inspectors will have to monitor a much larger number of facilities and—unlike those of its nuclear counterpart—will have the authority to conduct “challenge” inspections on short notice.

Critics of the treaty, such as Frank Gaffney of the Center for Security Policy in Washington, D.C., argue that the CWC is fatally flawed because the most worrisome countries may simply decline to participate. According to this view, the treaty will ensure the compliance of responsible countries that have no intention of acquiring chemical arms, while risking those countries' national-security and trade secrets. Yet determined proliferators may still acquire chemical weapons either by refusing to participate in the treaty or by secretly violating it. To paraphrase the National Rifle Association: if chemical weapons are outlawed, only outlaws will have chemical weapons.

CWC supporters respond that the treaty will create a new international legal norm, firmly establishing the pariah status of any country seeking to acquire or use chemical weapons. They also argue that the verification

regime specified by the treaty is likely to detect any violation of potential military significance, while allowing the participating countries to protect legitimate military and commercial secrets.

In Pursuit of Universality

The CWC will not at first encompass all current or potential chemical-weapons states. A number of such countries, including Egypt, Iraq, Libya, North Korea, and Syria, declined to sign the treaty in Paris. Even so, universal participation in the CWC is not a prerequisite for its effectiveness. During the Persian Gulf War, the possession and threatened use of chemical weapons by Iraq did not prevent the coalition forces, which were equipped with protective gear, from pursuing their military goals. In the aftermath of the war, the United States renounced any future use of chemical weapons after the CWC enters into force—even in retaliation for a chemical attack—and abandoned its previous plan to retain a small “security” stockpile until all other chemical-weapons states joined the regime.

Chemical weapons still pose a significant military threat to poorly equipped armies and unprotected civilians, as was demonstrated by Iraq's effective use of these weapons against Iran and its own Kurdish population. To address this problem, the CWC permits research on defensive measures that would lower the number of battlefield casualties, such as detectors, protective garments, antidotes, and decontamination equipment. The treaty also entitles countries threatened or attacked with chemical weapons to receive assistance and protection from other parties, and establishes a “voluntary fund” for contributions of defensive gear to countries lacking such equipment. As more countries acquire chemical defenses, the perceived military utility of employing chemical weapons will diminish.

Moreover, the handful of countries that refuse to sign and ratify the CWC will clearly signal their intent to acquire or retain chemical weapons. The United States and its allies intend to exert intense political pressure to bring these holdouts on board. Incentives for treaty compliance will include “carrots”—such as defensive assistance and freer access to chemicals, equipment, and technical information for legitimate commercial purposes—as well as “sticks,” such as the imposition on non-parties of more stringent export controls on chemicals and technologies with potential military uses.

Some countries may initially refuse to sign the CWC but later change their minds when they perceive that the benefits outweigh the costs, just as France, China, and South Africa eventually reversed their positions and signed the Nuclear Non-Proliferation Treaty. Furthermore, the eventual rise to power of new leaders in hold-out countries such as Iraq, Syria, and North Korea may

bring new adherents to the CWC.

Another reason that universal participation is not essential from the outset is that the CWC bans any sale or transfer to nonsignatory states of certain precursor chemicals that have both military and civilian uses. Because many countries attempting to build chemical arsenals—notably Iraq and Libya—have relied heavily on foreign assistance and materials, export controls would make it more difficult and expensive to acquire a chemical-warfare capability.

The Verification Challenge

Proponents and critics of the CWC agree that ensuring compliance will require massive, costly, and intrusive monitoring. Treaties limiting nuclear or conventional weapons call for inspections only of government-owned installations. The CWC, by contrast, applies to an estimated 25,000 commercial facilities worldwide that produce, process, or consume chemicals with both civilian and potential military uses—plus a virtually unlimited number of sites where clandestine warfare-agent production might occur.

Whereas control over nuclear proliferation relies heavily on tight accounting for the world's plutonium and weapons-grade uranium, no such strategy would work for chemical weapons. Each year, the global chemical industry produces, processes, or consumes some 70,000 different chemicals totaling billions of tons of material, according to Leo ZefTel, a consultant to the Chemical Manufacturers Association in Washington. The quantities of chemicals needed to manufacture a militarily significant weapons stockpile would be lost in the background noise of international trade. On-site inspections of chemical plants will therefore be essential. Indeed, verifying the CWC will require more on-site inspections than all previous arms control treaties put together.

Many of the materials in question are not only easily converted to other chemicals but are also inherently dif-



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ficult to detect. Unlike nuclear missiles, which are relatively few in number and can be counted from reconnaissance satellites, chemical-warfare agents can be stored in nondescript metal tanks or concealable munitions such as bombs and artillery shells. The chemicals and equipment used to make toxic warfare agents also have legitimate industrial applications.

Fortunately, two factors work in favor of the prospects for verifying compliance with the treaty. First, it is necessary only to detect chemical stockpiles large enough to have some military impact—on the order of hundreds of tons. Laboratory quantities do not require monitoring. Second, the number of potential warfare agents is relatively small: among thousands of known toxic chemicals, only a handful combine lethality with the physical properties required for military effectiveness—and nearly all are of World War I or II vintage. The developing world's known chemical-warfare states, such as Iraq, have sought to manufacture standard mustard and nerve agents—and few countries are willing to conduct the enormous amount of research, development, and testing required to create a new chemical weapon.

(Of course, further innovations are possible. Last October, two Russian military scientists claimed that the Scientific Research Institute of Organic Chemistry and Technology in Moscow had prepared a supertoxic chemical more potent than existing nerve agents. One of the two scientists was subsequently arrested and charged by the Russian security police for disclosing state secrets.)

Each signatory to the treaty must disclose to the OPCW the size and composition of its chemical stockpile; the number and location of all sites for producing, storing, or destroying chemical-warfare agents; and the identity of chemical plants that produce, process, or consume precursors and related industrial chemicals. The international organization will inspect these declared facilities to ensure that the disclosures are accu-

HANDLE WITH CARE: THE DESTRUCTION OF CHEMICAL WEAPONS

THE Chemical Weapons Convention (CWC) specifies that all stores of chemical agents and munitions must be destroyed within 10 years of the treaty's entry into force. These highly toxic materials must be eliminated in ways that pose minimal risks to the environment and to the health of nearby populations. But the countries with the world's largest stockpiles—the United States and Russia—have encountered a host of technical, political, and environmental problems with their destruction programs. Because of these snags, the estimated cost of destroying the U.S. chemical-weapons arsenal has quadrupled in five years, to more than \$8 billion. In fact, the U.S. and Russian chemical destruction programs face such serious obstacles that both countries may have to invoke the treaty's provision granting extensions of up to five years.

The U.S. chemical arsenal consists of 25,000 metric tons of agents stored in metal tanks or filled into rockets, land mines, mortars, cartridges, and artillery shells. Most of these items are stockpiled at eight military bases in the continental United States. Although the Army plans to destroy the chemicals in high-temperature incinerators to be built at the sites, this will be a complex task. Several types of munitions and toxic agents are involved, and because many of the chemical munitions contain high explosives and propellants, they will have to be disassembled before burning.

The Army has been performing tests since 1990 at a prototype facility on Johnston Atoll, a Pacific island 750 miles southeast of Hawaii. These tests have been



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plagued with technical problems, and the facility was shut down temporarily by a fire on January 3. A second prototype, built at Tooele Army Depot in Utah, is testing incineration equipment and processes. Construction of the first full-scale incinerator, also at Tooele, is nearing completion, and destruction of chemical weapons is scheduled to begin soon.

Nevertheless, the Army's single-minded pursuit of incineration has aroused opposition from environmental groups such as Greenpeace and the Sierra Club, and from some states and local communities where

the weapon stockpiles are stored. Critics contend that less than ideal operating conditions will result in incomplete burning and the release of toxic chemicals such as dioxin. People living near the proposed incinerators complain that the Army has not listened to their concerns. Opposition to the chemical demilitarization program has been particularly strong in Kentucky, Maryland, and Indiana, where incinerators are scheduled to be built in 1994 and 1995. Kentucky has passed a law forbidding the Army to build a chemical weapons incinerator until it certifies that no safer destruction technology exists, and other states are likely to follow suit.

Alternatives to incineration for destroying chemical weapons are all in early stages of development. Some of the more promising methods include chemical neutralization, oxidization in superheated steam, ionization by a strong electric current, and digestion by microorganisms. But the Army has tested only one of these technologies—chemical neutralization—on the scale required for a disposal program.

The congressional Office of Technology Assessment (OTA) concluded last June that the Army had neglected alternatives to incineration because of a narrow focus on cost and technical feasibility, ignoring political, social, and regulatory concerns. The OTA study noted that while the alternative destruction technologies are "perhaps several years behind the Army program's current development stage," political or legal problems could prevent or seriously delay the start of incineration at some or all of the eight storage sites.

Indeed, growing public opposition to

rate and will continue to monitor chemical weapons stockpiles and production sites until their destruction is complete.

Because existing chemical plants would provide an excellent cover for the illicit manufacture of chemical-warfare agents, the CWC will require intrusive on-site inspections to distinguish between legitimate and illegal activities. A plant producing the organophosphorus pesticide parathion, for example, could be diverted to the production of the nerve agent sarin. International inspection teams will have the right to visit declared

commercial facilities that produce chemicals of treaty concern. Such "routine" inspections will take place on 48 hours notice and may involve examination of production facilities, storage tanks, warehouses, laboratories, waste-treatment facilities, maintenance shops, offices, and medical clinics.

The manufacture of chemical-warfare agents also leaves distinctive byproducts that can be detected in samples taken from the production line and other sources. For example, three of the four major nerve agents contain a phosphorus-methyl (P-CH₃) bond,

incineration has led Congress to intervene. The fiscal 1993 military construction appropriations bill holds up any expenditures for construction of a new incinerator at Anniston Army Depot in Alabama until after a review by the Army of alternative destruction technologies that might be safer or cheaper. This review, which is due to be completed by year-end, will be based on a study by an expert panel now meeting under the auspices of the National Research Council. The panel is cochaired by Gene Dyer, a retired Bechtel engineer, and John Longwell, a professor of chemical engineering at MIT.

Dyer contends that local residents and public-interest groups have been unrealistic in demanding a destruction technology that produces no hazardous emissions. "No technology is absolutely safe," he says. "It's a question of balancing the risks of a known technology against those of another approach that may cost more and take longer to develop." Nevertheless, it seems clear that the Army will need to restore its credibility with the communities most directly affected by the chemical destruction program. "Unless the Army considers the political dimension of the problem," says OTA analyst Mark Brown, "even switching to a different technological approach may not prove any more acceptable."

Riddance in Russia

Having inherited the vast 40,000-metric-ton stockpile of the former Soviet Union, Russia too faces serious political and financial problems in getting its chemical demili-

tarization program under way. In 1990, a plant designed to destroy 350 metric tons of chemical agents per year was commissioned near Chapayevsk, 500 miles southeast of Moscow. But local citizens did not trust the military and were galvanized by the Chernobyl nuclear disaster. Their protests shut down the plant, which has remained idle for three years.

After the Soviet Union broke apart in December 1991, dismantling nuclear warheads took priority over disposing of chemical munitions. Late last year, Russia belatedly announced a proposal for the first phase of its chemical demilitarization program, which will involve the construction of two incinerators at existing stockpile sites and the conversion of one existing production facility to destruction activities. These three plants will be designed to dispose of about 45 percent of the Russian chemical arsenal, including mustard gas, lewisite, mustard-lewisite mixture, and various nerve agents such as sarin and soman. At one site, 3.5 million chemical projectiles must be destroyed.

The target date for commissioning the plants is mid-1997. But the Supreme Soviet has not yet made a decision on the proposed plan, and public resistance is growing. In a bid to gain the support of communities near the planned facilities, Russian President Boris Yeltsin signed a decree in June 1992 granting them special benefits, social facilities, and mandatory state insurance. Even so, the final outcome remains uncertain.

Russia's chemical demilitarization program suffers not just from public opposition but also from lack of funding. The

total bill for destroying the former Soviet stockpile could exceed \$10 billion, estimates Elisa D. Harris, a chemical weapons specialist at the National Security Council. The United States has offered technical assistance and modest financial aid (about \$25 million), but the money has not yet been spent. During the CWC negotiations, Russia sought permission to convert some of its former chemical-weapons plants to civilian production, claiming that destroying them would be a major financial blow to the Russian chemical industry. The United States reluctantly agreed to this provision while insisting on strict conditions to preclude reconversion to military production.

Russian scientists have also proposed a number of innovative ideas for beating chemical swords into plowshares. They suggest, for example, that lewisite could be processed into an extremely pure form of arsenic, used in the manufacture of micro-electronic chips. Since 1 kilogram of pure arsenic sells for about \$2,000, the quantity extracted from the Russian stockpile of lewisite might be worth billions of dollars. The Russian newspaper *Izvestia* has reported similar schemes for converting mustard gas into compounds that accelerate the vulcanization of rubber, and for transforming nerve agents into antiseptics and fire-retardants. U.S. industrial chemists are skeptical about the practicality of this modern-day alchemy, noting that environmentally safe technologies for processing lewisite and other agents have yet to be developed, and that the high cost of processing would absorb most if not all of the profits.—Jay Brin■

which requires a great deal of energy to destroy and thus persists for long periods in the environment. Inspectors might therefore be able to detect traces of nerve agents or their degradation products in the soil near a plant days or even weeks after production has stopped. Such chemical "signatures" might also be identified in a plant's liquid and gaseous wastes. (The inspectors, of course, must be sure that they have access to the actual waste stream. In a bid to evade detection, a violator might set up a phony waste stream and direct real production wastes into a hidden well or storage tank.)

Sensitive analytical techniques, such as the combination of gas chromatography with mass spectrometry, can sense as little as a few hundred billionths of a gram of substances associated with chemical-warfare production. In addition, remote-sensing technologies such as infrared laser spectroscopy can detect telltale compounds in the exhaust plumes rising from chemical-plant stacks. As improved emission-control technologies become more widely available, however, remote detection will become more difficult—further increasing the importance of on-site inspections.

CLASSIFYING CHEMICALS

THE Chemical Weapons Convention (CWC) applies different controls to three classes of chemicals, based on their toxicity and suitability for use in weapons. These chemicals are listed in "schedules" in one of the treaty's annexes. If new chemical-warfare agents are developed, the schedules can be revised without having to amend the treaty itself.

Schedule 1 lists 12 super-toxic chemicals or families of chemicals that include all known chemical-warfare agents—for example, sulfur mustards, nitrogen mustards, lewisites (blistering agents with effects similar to mustard), and nerve agents—their immediate precursor chemicals, and the biological toxins saxitoxin and ricin. The treaty bans nearly all production of these compounds, which have no commercial use. It makes exceptions for minute quantities that may be synthesized in research laboratories, and for a single pilot-scale facility to produce as much as 1 metric ton per year of Schedule 1 chemicals for biomedical research, pharmaceutical use, and development of defenses.

Schedule 2 includes three highly toxic chemicals that

have never been used militarily—the pesticide Amiton, the toxic gas perfluoroisobutene, and the potent hallucinogen BZ—plus eleven precursor chemicals for the known warfare agents listed in Schedule 1. Many of these precursors do have commercial uses. For example, about 100 companies worldwide use thiodiglycol—the immediate precursor of sulfur mustard—as an intermediate for preparing specialty chemicals or consume it directly for industrial uses, such as making ink for ballpoint pens. All facilities making Schedule 2 chemicals must be declared and are subject to routine inspections.

Schedule 3 covers toxic chemicals and precursors that have been either used as or considered as warfare agents but that are manufactured in large quantities for legitimate industrial purposes. An example is phosphorus trichloride—a key starting material for nerve agents that is also used to make pesticides, plasticizers, petroleum additives, flotation agents, and pharmaceuticals. Other substances listed in Schedule 3 include the poisonous gases chlorine, phosgene, and cyanogen chloride, which were used as weapons in

World War I but are also key ingredients in a wide array of commercial products. All plants producing more than 30 metric tons of Schedule 3 chemicals a year must submit detailed reports on their activities; facilities producing more than 200 tons must also submit to on-site inspections, which will be performed on a random basis.

Finally, the CWC states that plants making organic chemicals *not* listed in the three schedules must be declared if production of any particular compound is greater than 200 metric tons a year—30 tons for chemicals containing phosphorus, sulfur, or fluorine, the basic building blocks of chemical-warfare agents. Any unscheduled plants producing more than 200 tons a year will also be subject to inspections, beginning four years after the treaty enters into force.

Not listed on any of the schedules are nonlethal incapacitants and riot-control agents, such as tear gas. The CWC prohibits use of riot-control agents "as a method of warfare" but still allows their production and use for domestic law enforcement. Most countries think the treaty bans any use of riot-control agents in

a combat environment, but the United States has insisted on retaining the option to use such agents in "defensive military modes to save lives," such as controlling prisoners of war and rescuing downed pilots.

Matthew Meselson, a Harvard biochemist and leading expert on chemical weapons, charges that the U.S. interpretation creates a dangerous loophole that could eventually undermine the global ban on chemical warfare. Indeed, every major use of lethal chemical agents in combat has been preceded by the use of non-lethal incapacitants. Meselson also warns that permitting the limited use of these chemicals in combat situations could encourage the development of new incapacitating agents, perhaps derived from natural compounds, such as certain hormones and neurotransmitters that play vital roles in brain function. If disseminated in high doses, these chemicals might induce terror, fatigue, depression, hallucinations, or sleep. Meselson believes that during the treaty ratification hearings, the Senate should modify U.S. policy on the use of riot-control agents to reflect the prevailing interpretation of the treaty language. —Jay Brin ■

Because routine inspections will be intrusive and without right of refusal, the chemical industry has long been concerned that they could open the door to industrial espionage. The U.S. Chemical Manufacturers Association and its counterparts in other industrial countries worked closely with treaty negotiators to develop guidelines that would minimize the loss of trade secrets to foreign competitors. The treaty puts a limit of two routine inspections per year for any one commercial plant. Furthermore, chemical companies will be able to negotiate facility agreements with the OPCW defining the terms

and scope of the inspections. Such an agreement might, for example, permit inspectors to take chemical samples only from specified locations within the plant.

Inspection on Demand

Because routine inspections will be limited to declared chemical plants, a determined violator would most likely pursue illicit production in a secret facility. To deter this form of evasion, the CWC permits short-notice "challenge" inspections with only limited right of

refusal. Such inspections can be conducted at *any* civil or military facility—including chemical plants, ammunition depots, nuclear weapons assembly plants, and air force communications facilities—regardless of ownership and concerns about national security or commercial sensitivity.

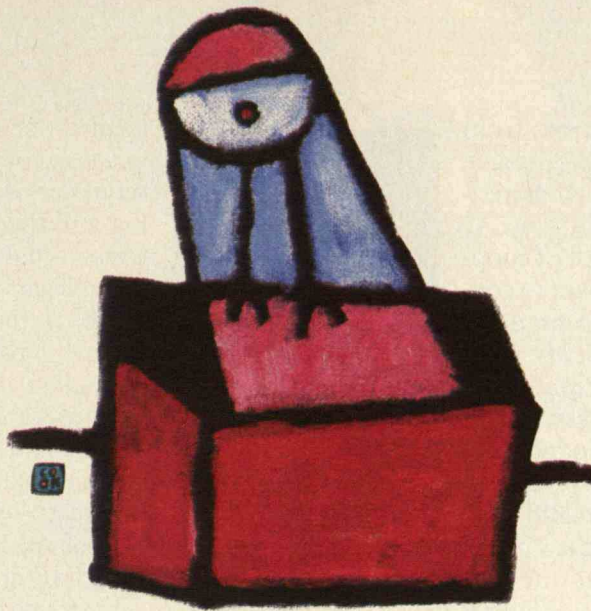
Challenge inspections will not only deter clandestine production but will also allow any party to the treaty to air its suspicions about the activities of another before the court of world opinion. Such inspections on demand will be “rare events of high political significance,” predicts ambassador Stephen Ledogar, head of the U.S. delegation to the CWC negotiations in Geneva.

The debate in Geneva over challenge inspections illustrates well the difficulty of balancing the goal of effective treaty verification with the desire of each country to protect its own national security. Initially, the United States appeared to favor highly intrusive verification over protecting military secrets. In 1984, then-Vice President George Bush submitted a draft treaty text that called for “anywhere, anytime” challenge inspections without right of refusal. Mikhail Gorbachev, surprisingly, accepted the highly intrusive U.S. approach in 1987, opening the way for a negotiating breakthrough.

But in 1991 the Bush administration, responding to growing concerns by the Pentagon and the U.S. intelligence community over the need to shield ultrasensitive military secrets, abruptly switched policies. The United States began calling for a highly restrictive approach that would permit the host country to deny access within the perimeter of a challenged facility.

This about-face irritated U.S. allies in Western Europe, who favored more intrusive verification measures. Britain sought to persuade the United States by conducting several trial inspections of its own classified facilities. The British demonstrated that “managed access,” such as the selective shrouding of sensitive equipment, could enable foreign inspectors to visit virtually any facility without compromising secrets.

Last March, the U.S. and French delegations hammered out a compromise. The United States agreed that inspection teams would be guaranteed permission to enter a challenged site, while allowing the host country



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to control the extent of access to protect sensitive equipment and data unrelated to chemical weapons. As a further safeguard, a challenge inspection can be called off by a three-quarters majority of the OPCW’s 41-nation Executive Council if the request is judged to be “frivolous, abusive, or clearly beyond the scope” of the treaty.

The CWC spells out a detailed protocol for challenge inspections. A challenged government must be notified at least 12 hours before an inspection team arrives in the country. Within 36 hours of that arrival, the host government must transport the inspection team to a perimeter designated by the challenging country, at least 10 meters outside the challenged facility. At the perimeter, the inspectors

may monitor traffic entering and leaving the site, use a variety of remote-sensing instruments, and take soil, air, and effluent samples.

The two sides may then negotiate for up to 72 hours over the extent to which the inspection team will be allowed to examine the facility, although *some* access must be provided not later than 108 hours after the team’s arrival in the country (as much as five days after the inspection was announced). The inspection itself may continue for as long as 84 hours. Previous arms-control treaties have usually limited such on-site inspections to 24 hours, if allowing them at all.

The CWC permits the owners of the inspected site to deny access to certain areas of a facility, turn off computers and data-recording devices, and shroud sensitive equipment. The treaty also lets the challenged party divide the site into sectors and let inspectors visit a certain percentage of their own choosing—an approach known as “random selective access.” For example, if the inspection is of a hangar containing military aircraft equipped with secret electronic-warfare systems, the challenged party might allow the inspection team to select and examine a single aircraft from which the electronic “black boxes” have been removed. After demonstrating that there is no room on board for concealing chemical munitions, the challenged party could then shroud all other aircraft of the same type. This arrangement will provide reasonable confidence that illicit chemical-weapons production or storage is not occur-

ring, while preventing the inspectors from piecing together the purpose of a sensitive facility or the quantities and types of materials being handled.

The treaty seeks to invoke a spirit of cooperation by urging the inspection team to conduct the inspection in "the least intrusive manner possible." At the same time, the challenged state must "make every reasonable effort" to demonstrate to the satisfaction of the inspection team that it is not producing or storing chemical-warfare agents at the inspected site. "The principle of mandatory but managed access enshrined in the CWC represents a major advance in verification, one that could be extended to other bilateral and multilateral arms-control agreements," says Michael Krepon, president of the Henry L. Stimson Center in Washington and an expert on arms-control verification.

Because the host country maintains considerable control over how much access it grants, the conduct of challenge inspections will probably depend to a large degree on precedent. The United States and other Western countries could set a good example by providing maximum access to their own facilities during challenge inspections—while making it known that they expect a reciprocal degree of openness from other nations.

Working Out the Details

On balance, the CWC may give too much control to the inspected party, who is under no legal obligation to cooperate fully. Uncooperative or even deceptive behavior, like that of Iraq toward the U.N. nuclear-weapons inspection teams after the Gulf War, would be permitted within the letter—though not the spirit—of the treaty. To make it more difficult for a violator to hide the evidence, it would be better to have access to a suspect site within 48 hours (rather than 120 hours) after a challenge inspection has been announced. Two days is probably the minimum lead time for an inspection, given logistical requirements and the need to protect sensitive facilities. But during the treaty negotiations, the protection of military secrets ultimately took precedence over the effectiveness of verification.

Even with its imperfect verification procedures, the CWC will deter illicit production. The goal of verification is not to catch all violations, which is impossible, but rather to make it more difficult and costly for countries to cheat, says Cosmo DiMaggio, a defense analyst with System Planning Corp. in Arlington, Va. By cutting off the easiest proliferation pathways, the treaty will drive up the financial and political costs of producing chemical weapons. Furthermore, although the CWC concentrates on monitoring production of chemical



agents, the acquisition of a chemical-warfare capability involves a more extensive sequence of activities—from R&D to testing and the development of military doctrines—that can be monitored by a variety of intelligence means.

The deterrent effect of the treaty will depend in part on the harshness of sanctions that follow upon the detection of a violation. Unfortunately, the CWC does not impose specific sanctions. Parties may restrict or suspend a violator's rights and privileges under the treaty—such as access to trade in dual-

use chemicals—or recommend "collective measures" conforming with international law, such as a trade embargo or, in extreme cases, military intervention. But the CWC does not make any of these actions an automatic consequence of misbehavior, leaving the decision to discipline a treaty violator to the discretion of the other participating countries.

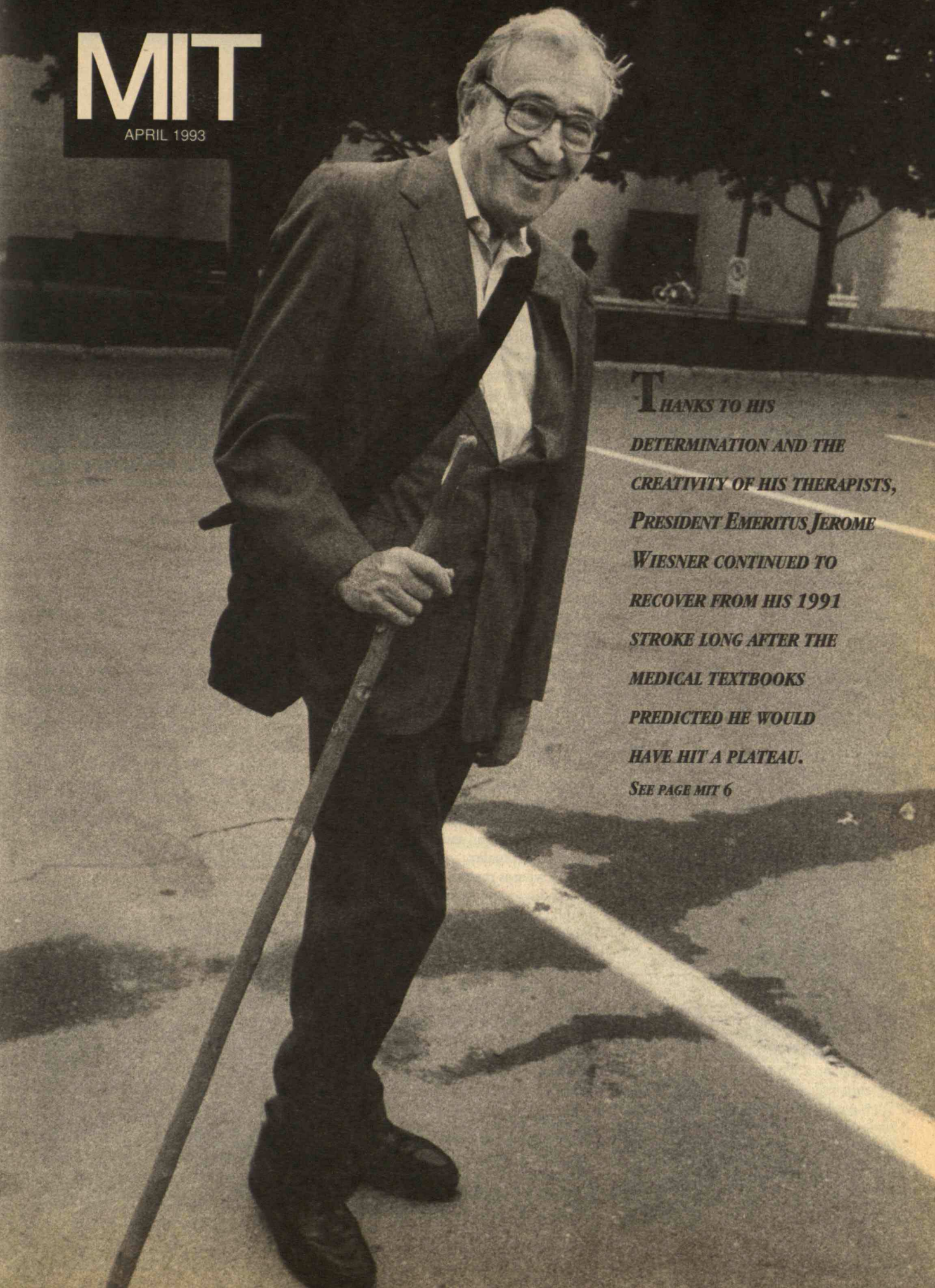
Ironically, the successful conclusion of the CWC will make it even more important to strengthen other arms-control agreements so that countries are not tempted to seek other weapons of mass destruction. Some analysts worry, for example, that outlawing chemical weapons may make it more attractive for countries to develop biological-warfare agents, which are easier than chemical agents to produce in small, clandestine facilities. Although the CWC bans production of biological toxins for offensive military use, its verification provisions are inappropriate for these substances. Some toxins are so potent that even modest quantities—below the CWC's threshold of required declaration—could have military significance. It will therefore be necessary to bolster the Biological and Toxin Weapons Convention of 1972, which lacks formal verification provisions such as mandatory declarations and on-site inspections.

Now that more than 50 countries have signed the CWC, the signatory states have convened a Preparatory Commission (Prepcom) in The Hague to work out the details of treaty implementation. The Prepcom will, for example, develop detailed procedures for conducting on-site inspections and collecting samples for chemical analysis. The commission will also prepare a data classification system to handle the enormous volumes of confidential information that the treaty's required declarations will generate.

Over the next two years, the Prepcom is expected to produce a document many times thicker than the 192-page treaty itself—and in many respects more critical. According to Robert Mikulak, special negotiator for chemical weapons at the U.S. Arms Control and Disarmament Agency, after more than two decades of haggling over the fine print of the CWC, "the real negotiation is about to begin." ■

MIT

APRIL 1993



THANKS TO HIS
DETERMINATION AND THE
CREATIVITY OF HIS THERAPISTS,
PRESIDENT EMERITUS JEROME
WIESNER CONTINUED TO
RECOVER FROM HIS 1991
STROKE LONG AFTER THE
MEDICAL TEXTBOOKS
PREDICTED HE WOULD
HAVE HIT A PLATEAU.
SEE PAGE MIT 6

ALUMNEWS

Going once, going twice . . .
Alumni/ae Travel: North Pole or bust

3

JEROME WIESNER

A scientist/educator's approach
to stroke therapy

6

CLASSES

Vladimir Dixon, '27:
The James Joyce Connection
Martha Munzer, '22

11

24

34

COURSES

40

DECEASED LIST

53

PUZZLE

55



COVER:

With a cane that is the only visible remnant of his stroke, Jerry Wiesner is again an integral component of the intellectual and social life of the Institute. Photo by Donna Coveney.



LETTERS

A VOICE IN THE NATIONAL DEBATE

I write this letter in a time of hope—hope that Bill Clinton will keep his campaign promise to eliminate discrimination against gays in the military and consequently bring an end to the controversy regarding the ROTC program. In the meantime, I applaud the MIT administration for upholding the Institute policy of non-discrimination on the basis of sexual orientation and for their efforts in bringing about change in ROTC policy (*TR October*, p. MIT 4).

I found Ted Hogg's ('47) letter (*TR January*, p. MIT 2), in which he supports the "right" of the military to exclude gays, to be most lamentable. Mr. Hogg's implication that homosexuality is a "physical handicap" is both offensive and ridiculous. He demonstrated his ignorance regarding human sexuality when he asked why, if sexual orientation is determined before birth, do young men and women take 20 years to figure out they are gay. Certainly even Mr. Hogg is aware that children do not understand sexuality and are merely mimicking the behavior they see at home, on the streets, and in the media. Gay youth, in the confusing time of adolescence, are trying so hard to fit in and to be accepted that they may not understand the differences they feel. Only when they finally figure out that the heterosexual model does not fit can they begin to understand and come to terms with their homosexuality.

And what is the reward for this journey of self-discovery? Parents forbidding them to tell Grandma, [former] Vice-President Quayle telling them they have made a "wrong choice," Colorado passing laws legitimating discrimination against them, and people saying that they aren't worthy to serve their country in the armed services. How sad. We, as gay and lesbian people, deserve much better.

JASONE E. JOHNSTON, SM '88
Washington, D.C.

MYSTERY BOWL

When I was president of the MIT Athletic Association back in 1946, MIT track and crew teams were top competitors, thanks to a strong V-12 [naval officer training] program. Remembering those glory days, I

read with great satisfaction "How Sweet It Is" (*TR October*, p. MIT 3).

It was wonderful to hear that MIT won the College Bowl, but it would be nice to know the sport or other basis of the competition. Perhaps with age, I have lost touch with such matters, or, due to failing eyesight, I overlooked the mention of this widely known fact. Please help me!

BOB WOFSEY, '48
Mamaroneck, N.Y.

Editor's Note: The College Bowl is an academic competition that quizzes contestants on a broad range of topics—including sports.

WHERE DO WE STAND?

I have never seen a statement of MIT's philosophy of education. Does such a document exist?

As I recall from my days as an undergraduate at MIT, all knowledge and data were considered a unified whole. Boundaries between subjects are artificial; in fact, the very term "subject" is artificial since only one body of knowledge and data exists. I believe that there should be no inhibitions for MIT students or graduates to move among various subjects and skills.

I welcome comments from other MIT graduates and the MIT administration.

EDWARD A. BRYAN, '55
Philadelphia, Pa.

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ALUM NEWS

Science Auction A Boston First

Massachusetts' first Science Auction is scheduled for May 22, sponsored by the MIT Club of Boston, the Boston Museum of Science, and the MIT Council on Primary and Secondary Education (CPSE). A professional auctioneer will be taking bids on items such as Edgerton memorabilia in an environment with added attractions that include champagne, hors d'oeuvres, and free rein of the West Wing of the Museum of Science.

The proceeds of the event will be divided between the Museum of Science and CPSE in support of special projects like "Imagine That!" a collaboration among the museum, CPSE, the Massachusetts Department of Education, and WHDH-TV (Channel 7) to use the power of television to promote math and science literacy. The auction idea originated with Joan Roth, MCP '81, president of the Club of Boston, who thought it might be an event that members would enjoy. And after reading an article in *Tech Talk*, she decided that focusing on "Imagine That!" would really energize their fund-raising efforts.

Ron Latanision, CPSE chair and professor of materials science and engineering, says that using mass media as a vehicle to build the public commitment to aca-

demic excellence is one of the main points on the council's agenda. "It's a tough sell. Education affects the whole social, economic, and political fabric of our community and of the country. For whatever reason, Americans just haven't reacted to the decline in our educational system with the same sense of purpose as we do a national security threat or a health crisis." Yet, Latanision stresses, "the system affects all of us. We want to include the discussion of K-12 education reform in the living rooms of families in the Boston area in particular and, ultimately, all over the U.S." Roth and Jorge Rodriguez, '60, co-chairs of the auction, agree.

"Imagine That!" has already produced one documentary and plans to do two more. When the first program aired last May on Channel 7 in Boston, almost half a million people were watching. The broadcast earned a rating that was good for an educational show. A staggering amount of work goes into a one-hour television production, Latanision says, and he couldn't have pulled off the first "Imagine That!" documentary without the many hours of volunteer consulting by MIT faculty.

WHDH-TV also sponsors *Beakman's World*, a syndicated children's show on which the wacky Beakman answers questions, has a great time in his laboratory, and shows how science affects our daily lives. In addition, WHDH-TV airs education-related pub-

lic service announcements and weekly features on community members who promote science literacy.

When a television station makes that kind of commitment to education, Latanision says, it needs feedback from the community. In addition to its primary, fund-raising function, the auction should serve to draw attention to and mobilize support for WHDH's efforts. The hours invested in the project by Club of Boston members are characteristic of the commitment of alumni/ae and the Institute to such efforts as "Imagine That!" in particular and to K-12 education in general, he says.

The Science Auction will be held at the Museum of Science from 7:30 to 10:30 p.m. Most of the items to be auctioned are science related, but the list includes sports tickets, weekend getaways, and other good stuff. Tickets are \$75 per person. Invitations will be sent out by early April to current members of the MIT Club of Boston and to people on the Museum of Science mailing list; all others may request invitations or information from Alumni/ae Association Regional Director Bonnie Jones, (617) 253-8222. □

—Amy Souza (The author is an administrative assistant in Alumni/ae Association Reunions and Special Events.)

ALUMNI/AE TRAVEL:

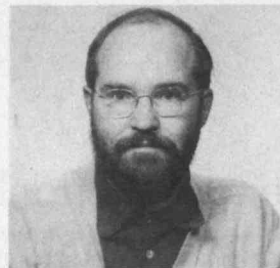
Adventure Plus Camaraderie

Professor John Edmond has traveled for the Association of Alumni and Alumnae of MIT before, lecturing to clubs around the country. His next audience will not be gathered at an urban hotel, however, but on the Russian nuclear-powered ice-breaker *Yamal*, bound for the North Pole.

Asked to sign on as a lecturer for the July 13-30 voyage organized by the MIT Alumni/ae Travel Program, Edmond



Kenneth H. Olsen, '50, who founded Digital Equipment Co. in 1957 and headed it until he retired in 1992, was named the first recipient last fall of the Entrepreneur of the Century award conferred by the MIT Enterprise Forum of Cambridge. The award recognizes "the singular distinction of a handful of 20th-century company founders who have revolutionized an existing industry or established a wholly new one, whose products and technology have had a profound impact on the nation, and whose executive leadership extends over more than a quarter of a century in the companies they have built."



In July the MIT Alumni/ae Travel Program is offering an Arctic tour aboard the Russian ice-breaker Yamal. MIT Professor John Edmond will be one of six university faculty providing the educational underpinning for this unique expedition.

jumped at the chance. He studies the chemistry of water—oceans, lakes, rivers, and precipitation—and he says that a trip like this is a natural for a scientist who spends as much time as he does in the field. Most recently, he has been studying rivers in the countries of the former Soviet Union.

Edmond will gear his lectures to the specific interests and level of the *Yamal's* passengers, but he expects to include the history of Arctic exploration. "People believe that those who explored the Arctic regions had very little experience," says Edmond, "but actually there was huge experience from whaling expeditions and the exploration of Greenland."

The significance of the Arctic to global ocean circulation and atmospheric warming will also be covered in his talks. "The Arctic is more sensitive to greenhouse warming because it is covered with a thin layer of pack ice; even small changes in temperature affect it greatly," Edmond says, adding that "Antarctica is a huge ice cap with enormous thermal inertia."

Last year, a North Pole trip was offered through Stanford, but Ann Brazier, manager of the MIT travel program, says 1993 is likely to be the last year for such a voyage because of organizational problems on the Russian end. "This is definitely not something you'll find in the *New York Times* travel section," she says. Edmond will be one of six faculty experts on board and the only one from MIT. All the passengers will be participating in university-sponsored travel programs, and there are still spaces available.

Clubs Host Events Around the World

The Arctic trip is a showcase production for the MIT travel program, which moved from the Quarter Century Club to Alumni/ae Association management only two years ago. Since the Association took it over, Brazier says, "our mission has been to make the travel program a more 'MIT product.' We have been very successful at creating an MIT presence on these trips."

Edmond is the second MIT faculty member to serve as a resource for program participants, but one of Brazier's goals is to have Institute faculty or staff as part of every group. Harald Reiche, retired professor of history, launched the lecture side of the travel program when he accompanied a tour down the Danube River in 1991.

That trip set another popular precedent when it opened with a dinner party hosted by the MIT Club of Istanbul and held at a restaurant owned by Mark and Nedret Butler, both of whom received MIT master's degrees in architecture in 1976. Since then, travel groups have enjoyed the hospitality of MIT clubs in such exotic locales as Nairobi, Singapore, Anchorage, Paris, and Indonesia, and closer to home in New Orleans and northern California.

"People are coming out of the woodwork to be hosts in their home countries to alumni travelers," says Brazier, who is doing everything she can to foster such connections. Brussels resident Lester

Gimpelson, '57, hosted a pub crawl in Belgium. And Johan Andersen, '41, one of those who enjoyed the royal treatment from the Club of Istanbul, was inspired to schedule a cocktail party for MIT travelers in the Leeward and Windward Islands at his self-designed, custom-built "residential cave."

One of the biggest hits was a reception hosted by the MIT Club of Shanghai during a Yangtze River cruise in October 1992. Sixteen MIT alumni, spouses, and offspring joined 22 Club of Shanghai members and guests, including Wentworth Chu, SM '24, who attended with his granddaughter. "It was one of the most heartwarming, friendly occasions," reports James Fitzpatrick, '50. "We arrived late, and when we entered the room they had their backs to us. The minute we said 'hello,' spontaneous comradeship [was established]!"

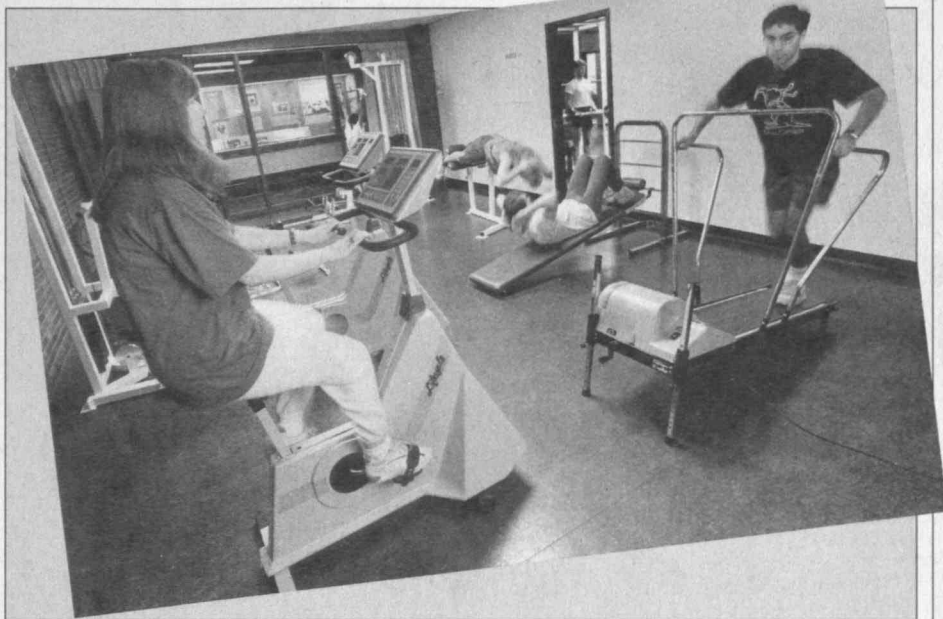
Shanghai Club President Xie Xide, PhD '51, was out of town that evening, but she made a special effort to return in time for breakfast with the travelers the next day. She went from table to table, meeting everyone in the room and making them feel welcome in her city. "She is a doer, a mixer!" says Fitzpatrick admiringly.

International travel is not without hazards, only some of which can be anticipated by even the most experienced travelers and tour organizers. During the 1991 Danube cruise, for example, war broke out in Yugoslavia. "We were moored right next to the gun-

boats that formed the military blockade at that point on the river," recalls Bonnie Jones, Alumni/ae Association regional director and the staff person accompanying the group. A complicated bus transfer, taking an entire day, got them to Hungary, where they met another ship and continued the cruise. "I heard that, while en route, we were within several miles of the fighting," says Jones. "People seemed to find it quite exciting."

The 20 destinations for 1993 include a London program planned collaboratively with the Boston Museum of Science, a repeat of the popular boat tour through the rivers and canals of central Germany, a cycling trip in Vermont, a ride down the Columbia and Snake Rivers in the Pacific Northwest, Venice in May, and a March voyage on the *Sea Cloud*, a tall ship famous among seasoned travelers. For more information on the travel program, alumni/ae may call (800) 992-6749. □

—Robert Dimmick (The author is the administrative assistant to the Alumni/ae Association executive vice-president.)



It's a lot easier and more pleasant for residents of MacGregor House to stay fit these days, thanks in large measure to new exercise equipment purchased with \$4,000 donated by house alumni/ae. John Wilson, associate director in MIT foundation relations and MacGregor's associate housemaster, says that this is just the beginning of an active partnership between students and former residents to improve the quality of life in the dorm. Among those putting the facility to good use are (left to right foreground) seniors Leslie Compton and Manish Bhatia.

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Barbara Goldberger, then an occupational therapist at Spaulding Rehabilitation Hospital, was one of several professionals who helped Jerry Wiesner try to regain function in his left arm, which had been rendered almost totally useless by a stroke.



STORY AND PHOTOGRAPHS
BY DONNA COVENEY

Jerome Wiesner's Greatest Experiment Was His Stroke Recovery

Jerry Wiesner woke up slowly, surveying the white ceilings, gray walls, and array of concerned faces around him: doctors, nurses, family. He was incredibly thirsty. He could tell that his blood sugar was low. Orange juice was what he needed. "Education?" he whispered hoarsely.

All the faces were trained on him, listening intently, but there was no response. "Education!" he cried again, more loudly. Why weren't they getting him the orange juice he was asking for? His son Zachary seemed to understand that something was needed, yet even he looked puzzled.

It would become clear in the days to follow that Jerome B. Wiesner, science advisor to the Kennedy and Johnson administrations, president emeritus of the Massachusetts Institute of Technology, and internationally renowned scientist, educator, engineer, and advocate of nuclear disarmament, had lost the ability to speak—except for that one word, "education"—in the thrombotic stroke he had suffered four hours earlier.

The medical personnel put his apparently nonsensical utterance down to post-stroke confusion. Zachary wasn't convinced, and began to play twenty questions. His father nodded affirmatively when Zachary honed in on the message, and eventually Wiesner got the orange juice. The game was a portent of the long process ahead as this gifted man recovered from storm damage to the circuits in his brain.

Jerry Wiesner is a man of uncommon spirit, intellect, and drive who inspired therapists to push the boundaries of their expectations. Over the next 17 months, they would explore exercises and technologies to help him regain his lost functions. His near-total recovery is a story not only of his own relentless work but of teamwork by speech, physical, and occupational therapists.

Wiesner's experience conveys a message of hope to some of the 500,000 Americans who suffer from strokes each year and also provides ammunition for the emerging theory of "brain plasticity," a new model of the way the brain reorganizes its own pathways after injury.

Wiesner's first inkling that something was wrong came one morning when he picked up the ringing telephone and discovered he couldn't say anything. His left arm wasn't responding normally. Alarmed, but having regained temporarily the ability to communicate, he woke Zachary, who sped him to the emergency room at Cambridge's Mt. Auburn Hospital. As a 74-year-old diabetic with atherosclerosis and a history of heart problems, Wiesner was certainly a potential stroke candidate. What's more, approximately one third of all stroke victims experience some "warning" loss of function—such as the ones he described—prior to a full-blown stroke. So arrangements were made for further tests at Massachusetts General Hospital.

He actually had the stroke while he was lying on an observation table at MGH. When he woke up, his left side was paralyzed, and he was almost totally unable to speak. (His physician, Dr. Arnold Weinberg, concluded that the fact that Wiesner is ambidextrous and therefore has language control in both sides of his brain is one reason his speech was so severely impaired.) Fortunately, Wiesner wasn't in pain, a fact that he would later say helped him concentrate on recovery.

During his early days in the hospital, an intern in the MIT/Harvard Health Sciences Program appeared in his doorway. "Just popped in to say 'Hi,'" greeted the student. "By the way, what's the integral of e^x ?" " e^x ," answered Wiesner automatically. The student grinned. "You're fine," he said, "there's nothing wrong with your mind." It was a telling moment.

"I realized that although I had some very serious deficits," recounted Wiesner, "I could think about them. That was a very lucky thing, because if you have a stroke that stops your cognitive functions, you're in much worse shape." Wiesner was fascinated by the "black holes" the stroke had created in his stored knowledge, both physical and intellectual.



Wiesner works with therapist Prudy Markos at Massachusetts General Hospital. It was a later, 12-week regimen of computer-controlled electrical stimulation, however, that turned the tide in his recovery of arm movement. Inset: he was also able to resume driving, aided by a full-width rear-view mirror.

The blood clot that had blocked an artery in his brain had severely compromised his retrieval system. Most frustrating was his inability to communicate all he was experiencing. He wanted to understand the problem and find a way around it. "Jerry gets very excited about anything to do with learning; he has always been interested in brain sciences," explains his wife Laya. "His own experience was, in a way, a perfect opportunity."

The first test of his ingenuity came early in his convalescence. Resting in his hospital bed, Wiesner realized that he didn't know the alphabet. "People would come see me and I'd say, 'What

comes after F?'" He laughed. "They'd think I was crazy. I wanted to know the alphabet beyond F. Pretty soon I had all the letters, but every time I did it, I lost one. And not the same one. Eventually, I had them all, but I couldn't get the order right. It took about two weeks of working to get to the point where I remembered all of the alphabet."

The complexity of his post-stroke compensation mechanisms surprised him, and he later wrote about the process. "It seems that I have trouble only when I am trying to speak out loud, and then it appears that I don't always make the right connections between the stored words and sound-producing mecha-



nisms. When this happens, it is very hard to get on to the right placement of the mouth and tongue. One thing that seemed to help was to raise my voice. We have had many explanations about why this happened, but none of them are really convincing."

Two weeks later, transferred to the Spaulding Rehabilitation Hospital, Wiesner began his speech therapy with Karen Haring. They worked daily at first and later two or three times per week, for a full year. "She put some order into my eager but unstructured activities by systematically exploring my speech problems, carrying out a series of diagnostic tests. For example, she was able to show that in spite of the fact that I couldn't spell and so couldn't write, I was able to recognize all of the words I was shown and knew

their meanings. This seemed to say that my library was intact, but I wasn't able to make a connection between the library and the voice or arm or whatever had to make the letters." He tried typing, but that didn't help. Eventually they found that he could say the letters and trace them at the same time, which helped him regain writing and spelling ability. Wiesner and Haring conjectured that the physical act of writing was different than typing and that there was "memory" in the arm/brain connection.

"Karen began by telling me that there was not a systematic process for rebuilding my language skills. She said that we would just have to experiment until we found things that worked," Wiesner reports. Haring allowed him to set his own goals, and she remembers that reading and writing were more important to him than improving his speech.

Former MIT faculty member Jerry Lettvin suggested that Wiesner mask out words as he was reading, so that he could focus on one at a time. This is a strategy that helps many dyslexics. The technique worked, and Haring later adapted it for the computer on which Wiesner learned to write.

"She psyched me out," laughs Wiesner admiringly. "She made games, we kept trying things, and it was clear that not only Karen but also her colleagues were talking about me and trying to figure out what I should do. This, too, was encouraging for me."

"There were times we laughed so hard," says Haring, reflecting on another element she and Wiesner consider essential—humor. "He had the darnedest time trying to learn to spell. He kept trying to sound out words phonetically, like kids learn—he had children's phonetics books by the piles—but it wasn't getting him anywhere. Finally (in order to distract him so he wouldn't sound out the words), I'd have him sing. We laughed so hard we nearly fell off the bed! It worked. Stroke patients can't go back and re-learn the same way they did as children."

Ultimately, he regained the ability to read anything he wants, use the computer to write, and to speak his mind—albeit with a few hesitations as he checks his internal database for the precise word.

Wiesner's physical deficits took a different course. In order to be allowed to go home from Spaulding Hospital, he had to demonstrate that he was able to walk 500 feet unassisted. It took five weeks. "The first day I couldn't walk one step, but slowly my therapist got me to do two steps, then four, then ten. I myself would have been very impatient. These therapists have confidence that if you stick with it, you'll do it. That rubs off on you."

He learned to walk with a cane, but his left arm was essentially useless. No amount of therapy seemed able to bring it back to life. Conventional wisdom holds that most, if not all, recovery from a stroke would happen within a year,

and that most patients reach a plateau after three to five months.

Yet in August 1991, some seven months after the stroke, he and Laya went to Martha's Vineyard, where a local physical therapist, Virginia Randall, agreed to work with him. "She gave me hope as she talked endlessly about the many people she knew who, after years of hard work and frustration, were rewarded by the return of useful function. Although my fingers got more limber, they did not move. But two weeks after we began to work together, I had a quite remarkable experience, one that I almost did not believe.

"At that time I tired quickly and went to bed before eight o'clock in a bedroom where I was all alone. It was unusually still and all I heard were a few bullfrogs, the Menemsha harbor bell two miles away, and my heart pulsing in my eardrums. As I lay there half awake, half asleep, I realized that I could feel a pulsing sensation in the fingers of my paralyzed hand that was synchronized with a slight but similar pulsing on the the right side of my head. As I played with it I found that I could make the sensation move from one finger to another, and at the same time the focus of feeling in my head moved, too. I soon saw that there was a unique spot in the head for each finger. I decided that this must mean that there was some nerve conduction between the muscles and my brain—though not enough to move the fingers."

Inspired, Wiesner thought to call an acquaintance who might be able to help him: Robert Moore, CEO of Computer Devices, Inc., a company investigating computer-driven electrical stimulation as an aid for victims of stroke and brain injury. "Your body learns to do something with enough practice, by rote," Moore explains. "If you are learning to do a swan dive, and you flip over in the attempt, the next



It took more than a year after the stroke, but Wiesner was once again able to enjoy the waters off Martha's Vineyard on his beloved Beetlebung with sailing buddy Dave Jacobs.

time you won't go so high. Ultimately you learn how to do it properly and do it automatically."

The stored set of brain data that control unconscious actions like walking, pitching a ball, etc., is called a template. Moore posits that the brain can rebuild templates lost in a stroke and believes that technology can help. The computer takes a reading off the good arm, for example, recording the electrical impulses produced by this individual's muscles when he picks up his arm and puts it back down again. The computer then feeds this information into a program that produces a corresponding pattern of impulses to be applied to the bad arm, to prompt it to perform on its own.

In conventional physical therapy, when the therapist moves an arm, the patient's brain is fully aware the movement is being initiated externally. But in computer-assisted therapy, the brain receives electrical impulses in a frequency it recognizes as its own. By a process not yet understood, Moore and his collaborators believe that the artificially generated impulses find a route to a functioning area of the brain.

With Moore's help, Wiesner underwent electrical stimulation treatments, three days a week for twelve weeks. Asked if he experienced significant improvement, he raises his once-immobile arm to ear level. "The evidence shows that

something has worked," he says, "but the fingers still need work."

Drs. Paul Bach-y-Rita and Richard Balliet, founders of the Neuromuscular Retraining Clinic at the University of Wisconsin, believe that "brain plasticity," the ability of one area of the brain to do

tasks previously controlled by another area, will allow for recovery over long periods of time. "Imagine the nerves as telephone cables between New York and Boston," says Bach-y-Rita. "If the cables are severed, calls between the two cities are initially impossible. With sufficient motivation, though, someone will figure out that by routing the call through Atlanta, the connection can be made."

It's a very appealing metaphor, but most of the medical community remains unpersuaded. Researchers such as Dr. Michael Moskowitz of Mass General say that proof of brain plasticity has yet to be established through replicable, controlled studies. Moore is much encouraged, however, by somewhat modest results: to date, more than 90 percent of a group of 150 long-term hemiplegic subjects (stroke victims who are paralyzed on one side) gained the ability to flex their elbows or ankles.

Self-directed as always, Wiesner remains intellectually interested in all the possible theories but untroubled by the controversy. One and a half years after the stroke he was out on the bay on his 30-foot sloop, *Beetlebung*, with sailing buddies Stan Hire and Dave Jacobs, a world-record-setting trimaran racer. Jacobs had been constantly tending the tiller and sails, trying to eke out every bit of speed he could from the boat. Now, with Wiesner at the helm, Jacobs let out a yell as he glimpsed the hull speed. "She's picked up two knots!" he exclaimed. Wiesner just grinned, tiller in hand. The day was sunny and the wind was fresh. Steady as she goes. □

—DONNA COVENEY is a photojournalist in the MIT News Office.



CLASS NOTES

16

Please send news for this column to: **Bob O'Brien**, acting class secretary, 25 Keith Rd., Pocasset, MA 02559

17

With regret I report the December 10 passing of **William Neuberg** of Darien, Conn. He attended Brooklyn Polytech before joining our Class of 1917. During World War II he was engineer of tests at Bethlehem Steel. He later participated in the construction of the New York subways. He worked at his father's company, Enco Chemicals, importer of chemicals in the 1930s and later established his own trading company. In the early 1950s, he developed "Endew," a product to prevent mildew, and with a friend established a wax business, Shamrock Chemicals, which now (Shamrock Technologies) employs over a hundred people, including a dozen scientists and engineers.

Will was a member of numerous business and technical organizations. For 40 years he lunched almost every weekday at the nearby Chemists Club, where I often saw him when the Alumni Center of New York had its luncheon table at the club.—**Don Severance**, acting secretary, 39 Hampshire Rd., Wellesley, MA 02181

18

As our numbers are decreasing, it is becoming more and more difficult to submit newsy Class of 1918 notes to *Technology Review*.

It was my pleasure to spend an afternoon and evening at the MIT campus on December 7, 1992. I was particularly impressed with the memorial service at the Weisner building for Professor Ann Friedlaender, who was the Class of 1941 Professor of Civil Engineering and Economics. It was my good fortune to have known her in a small way. The service was done with dignity - and left us all feeling that life is good when you give the best you have, and when you have so much to give.

In the evening I was at the MIT Faculty Club for dinner and a meeting of the Boston Seminar Series - of which I had the privilege of being its first chairman some 16 or 17 years ago. The speaker was Victor McElheny, director of the Knight Science Journalism Fellowships at MIT. He spoke in an interesting fashion with an active question and answer period following.

I record the passing of Elizabeth Howe, wife of classmate **Julian Howe** who predeceased her several years ago. A memorial service in her memory took place in Wellesley December 12, 1992.—**Max Seltzer**, secretary, 365 Central Ave., Needham, MA 02192

19

Most of our living classmates will soon be crossing the river and so I have sent some Christmas and holiday cards to their current addresses. I had a

few pictures of those who attended our 65th Reunion so I mailed them to those who gave the Alumni/ae Office their address.

I have been agreeably impressed with the showing of our Institute but at the same time I hope it never forgets the base it started from. Life has a fault some times of improving itself to death.

And again my wonderful classmates I wish you the best of health and happiness.—**W.O. Langille**, secretary, P.O. Box 144, Gladstone, NJ 07934

20

Please send news for this column to: **Harold Bugbee**, secretary, 313 Country Club Heights, Woburn, MA 01801

21

Christmas has come and gone and New Year's is only a few days away as this is written. I sent out Christmas cards this year and received only three cards from classmates. These were from Emma (Mrs. **Leon**) **Lloyd**, Helga (Mrs. **James**) **Parsons** and Betty (Mrs. **Norman**) **Patton**. Betty Patton took a 15-day guided tour of Israel during February and had a touch of pneumonia during the year. Helga writes she took a trip to the Northwest in June for a granddaughter's wedding.

One death reported this month: **Benjamin F. Williams** of Silver Springs, Md., on October 8, 1992.

Class president **Cac Clarke** tells me he has appointed **Bill Sherry** of Tulsa, Okla., as class VP.—**Sumner Hayward**, secretary, Wellspring House, E64, Washington Ave. Ext., Albany, NY 12203; **Samuel Lunden**, assistant secretary, 6205 Via Colinita, Rancho Palos Verdes, CA 90274

22

Having reached over 90 years of age, we are well aware that those of us left are indeed survivors. Your secretary must inform you of the passing of our classmates. The latest is **Hiram H. Maxim** on November 2, 1992. Hiram, who lived in Farmington, Conn., was the former president of Maxim Silencer Co. The company produced engine exhaust silencers for ships during World War II. In 1957, the company had developed a fast and inexpensive way to convert salt water into fresh. Hiram's son describes him as "a super person, a good parent, and a good leader of people and business."

Another of our classmates, **Thomas W. Alder**, died on October 2, 1992 in Tubac, Ariz. After graduating from MIT with a degree in management, he started his career in the retail management field. During World War II, he assumed positions in defense production management, and after the war, he became president of the Blake Manufacturing Co. He ended his career with a tour of public service in the Philippines.—**Martha E. Munzer**, secretary, 4411 Tradewinds Ave. E., Lauderdale By The Sea, FL 33308, (305) 492-8121

Editor's Note: Classmates should be sure to read the profile of Martha Munzer on page MIT 34.

23

70th Reunion

Partly because of poor health and partly because of other necessary business, your secretary is far behind with the Notes.

In regard to our 70th Reunion, our hustling president, **Royal Sterling**, reports that his call for financial aid for expenses has helped. If you have not kicked in, please do so. Also, he must know if you plan to attend in order to make reservations. This may possibly be the last planned reunion of our class. Report quickly to either Sterling or me.

Unfortunately, many classmates will be unable to attend this reunion, and this is the part your secretary dislikes. . . . Brigadier General **Russell E. Randall, Sr.** passed away March 14, 1992, in Pasadena, Calif. He prepared at New Hampshire University, attended classes at the Institute, and received a BS from the U.S. Military Academy in 1925. He was married, and he and his wife had three children. Randall served in several countries and on retirement served as consultant in several European countries. He was recipient of the Distinguished Service Medal, Distinguished Flying Cross, and the Legion of Merit. . . . **Bertram E. Warren** died in 1991. He received SB, SM, and ScD degrees in physics from MIT, married Elna Peterson, and they had two sons. Bertram competed in several activities in his undergraduate years at the Institute. Later he was made a professor and became a consultant and redeveloped X-ray diffraction for the study of the structure of matter. He taught in Europe and Egypt and was the first recipient of the International Union of Crystallography award. His hobby was trout fishing at his camp in northern Maine. . . . **Stearns H. Whitney** died April 10, 1992. He attended Westchester Community College and Fordham University before entering MIT, where he studied courses in mechanical engineering. He ultimately received a degree in civil engineering. Stearns married Margaret, and they had seven children. Beginning as assistant to the technical engineer, North Packing & Provision Co., he became business manager for the Town of Arlington, Mass., School Department. Later he worked in the National Reemployment Service and the New Hampshire State Highway Department. He was an engineer in design for the Quonset, R.I., Naval Air Station and the U.S. Seabee Base. Then he was a field engineer for Factory Mutual Fire Insurance Co. of New York and Improved Risk Mutuals, from which he retired.

Edwin M. Goldsmith, Jr. died on May 4, 1991, according to a belated report. He prepared for the Institute at the University of Pennsylvania, receiving the SB in business and engineering administration. He was a member of several societies as an undergraduate. He married Helen R. Jacobs of Philadelphia, and they had one son and two grandchildren. Edwin was engineer management consultant for several manufacturing firms. He began working with Thomas Holms Manufacturing Co. and was VP until his retirement in 1968. . . . **Hebert L. Hoyde** died May 2, 1992. At MIT, he received an SB in mechanical engineering and he was captain of the varsity hockey team. He married Katherine Owens of Lewisburg, Pa., and they had three children. Before World War II, he worked in several explosives companies. He wound up his 37-odd years with Du Pont as works manager of the Doyle Works in Leominster, Mass., retiring in 1965. He

was active in private life as well as in his vocation, a truly full and rewarding life.—**Frederick Almqvist**, secretary, 19 Griswold Rd., Wethersfield, CT 06109

24

My near neighbor, **James H. (Jimmy) Doolittle** has another honor to add to his list. The National Academy of Engineering has named him a distinguished honoree for his service "to the advancement of aviation, engineering, and the nation's welfare." He is only the second person to receive this honor from the NAE. Congratulations to a most distinguished classmate.

From the Alumni/ae Association comes the notice of the death of **Edwin C. Lindstrom** on June 29, 1991. He lived in Vernon Rockville, Conn. At this time, there are no known survivors.

Yours truly is taking off on a cruise to Mexico for Christmas and New Year's. By the time you read this, I will be back home and unpacked, hoping to stay home for a while.—Co-secretaries: **Katty Hereford**, Box 5297, Carmel, CA 93921; **Col. I. Henry Stern**, 2840 S. Ocean, #514, Palm Beach, FL 33480

25

A card from **Lil Drew** indicates she is doing well in Laguna Hills, Calif. . . . A letter from **Court Worthington** reports that he and Margaret keep active in local affairs—social, civic, and church. He keeps busy with hobbies such as bird watching and lessons at the art association. Because of a severe storm along the coast of New England in mid-December, Court's section of Cape Ann was without power for 27 hours. Court and Margaret have cut down on foreign travel but did visit their son's place in Switzerland last summer and plan to visit Antigua in February. Court notes how the family has grown, including in-laws, to a total of 25, which includes 5 great-grandchildren.

A card from Adele brought the sorrowful news that **Ed Kusssmaul** died in his sleep September 23, 1992. They were at their winter home in Boynton Beach, Fla. Ed was a loyal classmate and a hard worker in the interest of the Class of 1925. Over the years he worked on reunions, serving on every reunion committee from the 25th to the 60th. He was also deputy chair and co-chair of other committees. He was ever-willing to take on any job requested of him and completed it well. Ed lived in Westwood, Mass., for several years and was active in school affairs, chairing the PTA and serving on the school committee, two years as chair. He was also involved with several school building committees and chaired the local Red Cross unit. Ed was president of the Kelek Co., which he founded in 1945. The company manufactured electrical controls and distribution equipment for industry and utilities. Ed is survived by his wife, Adele, as well as children and grandchildren.

The passing of **Maurice T. Freeman** must be reported. He died at his home in Winchester, Mass., on October 7, 1992. Following graduation Maurice obtained a master's degree at Harvard. In 1927 he became a member of the staff of the research department of Loomis, Sayles and Co., Inc. He was named director of the investment research department in 1942, executive VP in 1958, and became president of the company, chair of the board, and chief executive officer in 1963, holding that position until retirement. Maurice was director of Standard Shares, Inc., and was a Centennial Life Member of the Museum of Fine Arts in Boston. In 1947, in addition to his full-time post in the investment field, he accepted the chair of the board of trustees of the Winchester Hospital and served in that capacity for the following 27 years, being responsible for the management of all endowment funds. Keenly interested in his home community, Maurice gave freely of his time, talent, and energy as a member of the Wildwood Cemetery Commis-



1962—The four members of the Class of 1927 who graduated together from Springfield Technical School gathered at the Oyster Harbors Club on Cape Cod for a 35th Reunion photo 31 years ago. From left: Arthur Connell, Dick Cheney, Bud Fisher, and Gordon Calderwood.

sion, the Water and Sewer Board, and the town finance committee. He also served as chair of the investment trustees with the Winchester Senior Citizens. Maurice is survived by 4 daughters and 10 grandchildren.—**F. Leroy (Doc) Foster**, secretary, 434 Old Comers Rd., P.O. Box 331, North Chatham, MA 02650

26

Malcolm B. Epstein of New Mexico writes that his recent move to that state from Missouri was necessitated by his wife's asthma. He noted that he was still active with his company but had commuted for about two years, retiring on November 1, 1991. Within the two-year period, he purchased a new apartment and is now getting adjusted to the changes.

Two classmates have died. **Dwight K. Taylor** of Franconia, N.H., died October 4, 1992. He earned his MIT degree in chemical engineering. Taylor had a long career with Connelly, Inc., Chicago, Ill., and he retired and moved to Franconia in 1968. He then was employed by Joseph Herbert Plumbing and Heating. Some of his many involvements included the Western Springs Theatre, Western Springs in Ill., the Franconia Planning Board, the North Country Council, and the Franconia Church of Christ. He was a 32-degree Scottish Rite Mason, a member of the Bektash Temple Shriners, and master of Parker Lodge in North Woodstock. He held the Knights Templar Cross of Honor and received the Meritorious Service Award. He was well known for his hobby of repairing antique clocks. He is survived by his wife, Mary Higgins, a son, 6 daughters, 19 grandchildren, and 11 great-grandchildren.

Ralph A. Waugh of Newmarket, N.H. died October 26, 1992. He attended Grace Church Chorister School in New York City and was the leading boy soprano and soloist. He later attended the University of New Hampshire, Rhode Island School of Design, Harvard, and MIT. He was a registered architect in New York and worked for Cameron Clarks. During the Depression, he worked for the WPA and was head of an architectural team out of UNH that did a survey of historic American buildings in New Hampshire. Before his retirement, he worked for Lockwood Green Construction Co. and traveled to many locations as general superintendent. In his retirement he was a founder of the Newmarket Industrial Commission. He was a member of St. George's Episcopal Church in Durham, where he was a licensed lay reader. He was a 55-year member and former SW of the Rising

Star Lodge F&AM. He was a charter member of the Newmarket Historical Society. Survivors include his wife, Estella, a daughter, five grandchildren, and eight great-grandchildren.

Please send news to: **Donald S. Cunningham**, secretary, Eventide, 215 Adams St., Quincy, MA 02169, (617) 328-1840

27

Gordon Calderwood is in good health at 88, has enjoyed married life for 60 years, and lives in Rochester, N.Y. He worked for Rochester Gas and Electric for 41 years, mostly in gas production. When the gas lines were installed from the West, he worked on the distribution of natural gas. He retired as director of safety for the utility company.

Gordon reported the death of **Richard E. Cheney** in Santa Barbara, Calif., on December 14, 1992. At 16, Dick was our youngest freshman. He came to MIT from Springfield Technical High with three of his class—**Arthur Connell**, **Harold (Bud) Fisher**, and **Gordon Calderwood**. (See photo above.)

Dick's wife, Estelle, stated that he had suffered a blood clot in his leg, which resulted in an operation, after which he died in his sleep. He had survived several strokes in recent years. Dick served for 30 years as executive secretary and president of the Glass Manufacturers Association in New York City. Since his retirement in Santa Barbara, he had been active as a consultant. Through his efforts over 15 years ago, his community established the first and most comprehensive recycling collection system, before recycling became an essential part of our lives.

Samuel Pearlman of Collins Ave., Miami Beach, Fla., died June 1, 1992. His widow, Thelma, wrote of him as "a very gentle man" whose death was "a terrible loss to all."

We send our condolences to the widows and families of these two classmates.—**Joseph C. Burley**, secretary, 1 Harbourside Dr., Delray Beach, FL 33483; **Lawrence B. Crew**, assistant secretary, 21 Yowago Ave., Branford, CT 06405

28

65th Reunion

Highlighting our notes in this and the next issue will be our 65th reunion, June 2-6 (or parts thereof). It promises to be a rewarding occasion, but will be tempered in spirit compatible with individual considerations. Many intentions to attend are qualified by "cir-

cumstances permitting," as might be expected.

Added to those mentioned in the February/March Review who are planning to attend are Margaret and George Mangurian, Rose and Maurice Beren, Marjorie (wife of Joseph McDermott), Lucille (wife of Samuel Weibel), Verna and Carroll Smith, and Marjorie (wife of John Carvalho). Unfortunately, addresses are not included, but any form of communication among individuals will help provide support or inducement to you or others to attend—at this point, we are all on a "committee of the whole." Spread the word. It was a fine accomplishment of our Class to have voted at the 50th Reunion that all spouses of graduates are officially associate members.

Along with intentions to attend are declarations that attendance is not possible. Such word has been received from Paul E. Ruch of Santa Ana, Calif. Paul is still active with his long-range weather forecasting research. Regrets were also received from Gertrude and Henry La Croix, Claire (wife of Theodore Pierce) and Bill (William) Hurst, who is recovering from a broken hip but who keeps busy with his TV and mathematics while being cared for by his pet cat. This information gives others an idea of whom they may or may not see at the reunion.

The inevitable death notices have further reduced our numbers. Arthur Roscoe Elliott of Newport News, Va., died in November 1992. . . . Richard Sumner Carroll of Enfield, Conn., died November 13, 1992. . . . Thomas Guille Harvey of Indianapolis died on November 26, 1992. . . . Alice (wife of Mieth) Maeser died November 15, 1992, and Judith (wife of Dr. Benjamin) Miller died May 24, 1992.—Ernest H. Knight, secretary, Box 98, Raymond, ME 04071

29

Notice of resumption of duties as class secretary December 31, 1992. . . . The year 1992 was not a good one for your secretary. It started with a normal cataract operation last June to improve my vision to facilitate getting my auto license renewed. The operating doctor was the same internationally famous ophthalmologist who operated on the same eye six years ago for glaucoma after my bicycle/auto accident, thereby saving my eyesight. The

doctor declared that the most recent operation was a simple one, with only 5 percent risk of disturbing the glaucoma surgery done six years ago. (He also said it was possible my vision would improve 85 percent.) Wouldn't it be my luck to have the 5 percent possibility become the ruling factor. For almost seven months! It was not just a bad dream, it was a nightmare.

During my ordeal, I received numerous encouraging get-well cards and telephone calls urging me to stay on course and not give up. Foremost among them was our class president, Jerry Gardner, and his wife, Ellie, who kept abreast with the developments weekly, sometimes more often, which meant a lot to me and my wife, Helen. I still have some additional treatments before I reach my goal. We are still in Arlington, Mass., and have tasted enough New England snow and blizzards. We hope to get to Florida by early February.

It will be a little while before I get back to a normal workload, but I'll do my best. Birthday cards were also suspended out of necessity, but January will see the cards in the mail. Many thanks to those who sent messages of encouragement during this dark interlude.—Karnig S. Dinjian, secretary, P.O. Box 83, Arlington, MA 02174

30

Tom Wigglesworth's sale of T.R. Wigglesworth Machinery Co. to his son and the formation of a new enterprise operating under the name Wigglesworth Ventures, Inc., were reported in the Notes several years ago. Tom is now working on a program to supply equipment to schools and colleges as a means of whetting student interest in machine tools, and recapturing some of the machine tool business that has gone overseas in recent years. In particular Tom's "Ventures" company has made available "a very unique machine tool teaching combination upgraded from numerical control to full computerized numerical control and driven by a computer program, all at a very affordable price that every high school, trade school, and college can afford." Last spring Tom accompanied Dottie to San Francisco where she acted as a judge at a flower show, after which they took a Princess Line cruise to Acapulco. On the way

back they visited Bob Nelson, who "is living in a beautiful retirement home in LaCrescenta" near LA. His address is 2820 Sycamore Ave., and he would like to hear from classmates

A brief note from Carroll Bailey reports that he retired in 1968 as a physics professor at Bates College in Lewiston, Maine, where he and his wife, Kathryn, still live.

We have at hand a biographical letter from Bill Alling, one of the three members of our class who moved from engineering into the ministry. Previous Notes have described his career as a clergyman, including the various pastorates in which he has served and his two years as a teaching missionary in Korea, during which period he lived with a Korean family. However, his earlier career has not heretofore been reported. In 1929 Bill graduated from the University of Rochester with a BS in chemical engineering and thereafter entered the summer school at MIT. In the fall, he enrolled in Course X-B, the undergraduate Practice School program, which happens to have been my own course. In the spring of 1930, we were divided into two rather small groups and went separately to the Buffalo and Bangor stations, then together to the Boston station. Bill recalls that his group included Morris Young, Elmer Harmon, Fred Holt, and Alan Vint. My group comprised Birnbaum, Siegel, McCarron, Steffens, Charley Ladd, and Kuan Lu.

In the summer of 1931, Bill entered the employ of Industrial Rayon Corp. in Covington, Va. In 1938, he was transferred to their new plant in Painesville, Ohio, and a year or two later to Cleveland. In 1947, he "realized that the Lord wanted me in Christian work, so went to Faith Seminary, which was then in Wilmington, Del. I preached in small churches and in 1957 was asked to teach science, math, and Bible at a Christian school in Walker, Iowa. I retired from teaching in 1982." Bill now lives in Ardmore, Ala., where he still does some visitation, gathers fuel for the wood-burning stove in his trailer and mows adjacent fields with a bush-hog.

Ted Bridge's wife, Eleanor, died a year ago after six strokes. He now lives in Moraga, Calif. He says: "I am 85 and lucky to get around as well as I do, albeit leaning heavily on a cane. I walk a half mile almost every day. My daughter Anne and her husband, Dan Smith, take good care of me in their home. I read a book from the library about every

Alumni/æ Week Reunions 1993 Technology Day



"C'mon back to Tech, dam it!"

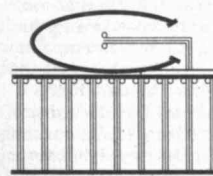
To receive a complete schedule and registration form, call 617-253-8232. And if you're not sure what Cardinal and Gray is all about, see page MIT 17.

Thursday, June 3

- Cardinal & Gray Reception
- Pre-Pops Dinner
- Tech Night at the Pops
- Post-Pops Gathering

Friday, June 4

- Memorial Service
- Technology Day Program
*Riding the Wave of Innovation:
The Ocean & MIT*
- Technology Day Luncheon
- Technology Day Reception
- Cardinal & Gray Dinner



MIT
Cardinal and
Gray Society

two weeks." His recent favorites are *A Brief History of Time* and *Understanding DNA and Gene Cloning*.

We have at hand notices concerning the deaths of two more classmates: **Bob Armstrong** last July 14 and **Al Luery** on August 11. Bob was born in Chadron, Nebr. He received an SB with our class in 1930 and a PhD in 1935. In 1937, after serving briefly on the MIT faculty, he left to work on the Crash Synthetic Rubber Program made necessary by the cut-off of natural rubber supplies. On completion of that research he volunteered for naval service, but instead of being inducted, he was sent to the office of the Alien Property Custodian who requested that he go to Tennessee and aid in building a rayon tire cord plant at a seized German-owned facility. At the end of the war, he was tapped by N. C. Governor Luther Hodges to assist in the creation of the Research Triangle Institute. He later worked for Celanese, where he became VP and technical director and remained chief technical officer until his retirement in 1974. He is survived by his wife, stone sculptress Jane Botsford Armstrong, and a son by a former marriage, Robert Armstrong Jr.

Al Luery was born in New York City and grew up in Plainfield, N.J. After graduating in Course VI with our class, he worked briefly for AT&T as a lineman during the Depression. From that job he went to American Rock Wool as an engineer. During World War II, he joined the Corps of Army Engineers and was assigned to the 198th AAA Group in Bora Bora. After the war he went back to ARW for a time and then took a job as project construction engineer with the Celotex Division of Jim Walter Corp. until he retired in Largo, Fla., in 1975. In retirement he was a model train buff, drove for Meals on Wheels and was president of his AARP chapter. Al's first wife, Jeane, died in 1986 and in 1990 he married Maxine MacFarlane, who survives him. He is also survived by two sons, Donald of Springfield, Va., David of Berwyn, Pa., and two grandchildren.—**Gordon K. Lister**, secretary, 294-B Heritage Village, Southbury, CT 06488

31

Please send news for this column to: **Wyman P. Boynton**, secretary, 668 Middle St., Portsmouth, NH 03801, (603) 436-1309

32

I have a bit more to tell about our 60th Reunion's open mike, "Reflections of Octogenarians." ... **John Northup** took the microphone, saying it is always good to consider the audience you are speaking to. He knew our ages and that our past is longer than our future. John recalled asking his 90-year-old mother how it was to be old. She replied, "It's hell! Your friends are dying off and you don't make new friends easily. You have to work at it." John continued: "When you gather with your friends, sooner or later, you end up talking about health. I strongly recommend that you buy a book for about \$35, *Mayo Clinic Family Home Health*. It tells you everything you want to know. ... When I went West in my early years, I was told by an old MIT man: 'Forget you went to MIT.' I found it was good advice. When I was negotiating a business situation and they knew I went to MIT, they said, 'He's a smart SOB, we better watch out.'" John attributes most of his success to luck. His biggest success was in choosing his wife. In their first 13 years they changed homes 13 times. ... **Tom Weston** had to tell us one more story. A 100-year-old man was being interviewed by a newsman in his second floor apartment. "Yes," he was temperate and moderate in all his habits. They heard a loud commotion in the floor below. "What's that?" asked the newsman. "That's my Dad! He's drunk again!" was the answer. ... **George Falk**, our songmaster throughout the reunion, closed the evening by leading us in some Tech songs.

We have news that Professors **Nevill Hogan** and **Derek Rowell** are the new co-directors of the Erick P. and Evelyn E. Newman Laboratory for Biomechanics and Human Rehabilitation.

The Newman Laboratory is one of the largest labs in mechanical engineering. Its mission is to educate mechanical engineering students through leading edge research to understand and augment human performance.

Wyman P. Boynton, '31, informs us that **John Freeman Bradley**, 86, died August 14, 1990, in the Exeter Hospital. He was a well-known architect who focused on commercial and institutional architecture. He leaves his wife, Junia, two daughters, two sons, 12 grandchildren, and a great-grandson. ... We learn through **William Pearce** that **Cecil Boling** died on December 4, 1992, due to a fall downstairs. ... The MIT Alumni/ae Association informs us that **Colonel Arthur La Capria** died on September 15, 1992. When we receive obituary information on the above, we will pass it on. These notes are written during the Christmas season. So much good will abounds in the midst of this troubled world. We must hope that peace and good will prevail. On behalf of all the class officers, we wish our classmates a joyous New Year.—**Melvin Castleman**, secretary, 163 Beach Bluff Ave., Swampscott, MA 01907

33

60th Reunion

I hope you've marked your calendars after hearing from **Dick Fossett**, **Ferd Johnson**, and **Bill Klee**, who are busy planning our 60th Reunion June 2-6, 1993. Dick and Ferd head up a hardworking committee who want to see you back at Tech. The reunion consists of two parts—in Cambridge from Wednesday until Friday afternoon and at the Sheraton Tara in Danvers from Friday morning until Sunday morning. The registration package will be mailed to you in early spring.

The letter Klee sent out in mid-December has created a pretty good number of responses, but not enough. *For heaven's sake*, write to him at the address below so that (whether or not you make the reunion) you will receive copies of notes by classmates and obituaries with remarks from survivors received since January 1. This is your last chance to record your remarks—your past (illustrious or nefarious) for your classmates, and it probably will activate some friendships neglected for decades. Do it!

Ellery Clark writes from Yucaipa, Calif., that both he and his wife are planning to attend. Both have had serious operations for cancer, but are doing okay now. ... **Sulo Paananen** writes from



George & Sylvia Falk, songmasters at the Class of '32's 60th Reunion.

Sarasota, Fla. He plays a little golf now and then. For sure, getting older! ... **Winthrop Conant**, retired from Power Systems, Bloomfield, Conn., in 1991.

Neil Hopkins, York, Pa.: "Main occupation is home care of wife, Ruth, confined with Parkinson's disease. ... **Phil Coffey** is interested in attending. In addition to the MIT education, he also obtained an MA in journalism at Colorado. He is retired from the U.S. Public Health Service and is currently active in the Retired Officers Association and Spanish Club. ... **Bob Dobson** of Lincoln, Nebr., plans to attend.

Dayton H. Clewell died in November 1992. He received an SB in 1993 and a PhD in 1936 from MIT in physics. He had a distinguished career beginning with Optics Research of Easton, Pa., then with Mobil Oil from 1938 until 1977, at which time he worked in a consulting capacity. Clewell served on numerous advisory boards, including U.S. Department of Energy's Research Advisory Board, MIT's Energy Laboratory Advisory Board, and the National Advisory Council on Oceans and Atmosphere, among others. He held 30 patents (including the gravity meter), authored/co-authored over 15 publications, and served as keynote speaker for numerous international conferences.

He was preceded in death by his wife, the former Jean Rapp of Boston, in 1984, and is survived by a son, Don Clewell of Ann Arbor, Mich.; a daughter, Nancy Forsdick, 422 Oliveta Place, La Canada, CA 91011; and four grandchildren.—**Bill Klee**, secretary, P.O. Box 7725, Hilton Head Island, SC 29938

34

Carl Wilson writes that on June 21, the longest day of the year, Molly and he arrived in Fairbanks, Alaska. Louisa and **Bob Hisamoto** took them on a tour of Fairbanks. They stopped at the new Head Start Building, constructed largely through Bob's efforts. Bob started a Head Start Program in Alaska for Native American children. When the need for more adequate quarters arose, Bob secured local government funding subject to the condition that the cost of labor must come from other sources. He met this condition by signing a personal note to cover labor costs. Bob is advisor emeritus and a director of the Foundation for Preschool Education. He has been elected to the Hall of Fame by the Alaskan Quarter Century Wireless Association. He operates a World Peace Network on amateur radio three times a day.

Carl also reports that **Gerry Ansel** is a busy volunteer in the Centerville, Ohio, public schools, teaching first and second graders how to use computers. Gerry spends two afternoons a week as "a reader, secretary and bookkeeper for a blind priest." His wife, Ada, suffers from Alzheimer's disease. The Anselms moved to Ohio to be near their children, when Gerry retired from Dow Chemical.—**John A. Hrones**, president, 9397 Midnight Pass Rd., Apt. 306, Sarasota, FL 34242; **Robert M. Franklin**, secretary, Box 1147, Brewster, MA 02631

35

Ben Blocker wrote, saying he had finally left Benda Products, Inc., which he started in 1947 (he had sold his interest in it prior to our 50th). So he is now fully retired. His wife, Hannah (Radcliffe, '35), and he will have celebrated their 55th wedding anniversary in February 1993 with their two sons, their wives, and six grandchildren. Ben and Hannah now live at 205 Langley Rd., Newton, MA 02159.

Les Brooks writes from Rockmart, Ga., "I finally gave up consulting a few months ago, and about then I was pleasantly surprised to learn I had been elected to the board of directors of the Northwest Georgia Golfers Association. It should be fun and keep me occupied." Les thought they may have felt sorry for him, since he had played in about 100

tournaments in 10 years and never won a prize. "I've noted that many of those who did win skipped that grade where they taught arithmetic." In November and February, Les and Ellen spent some time enjoying the warm water and walking the beach on Grand Cayman Isle and Grenada. There was a nine-hole course on Grenada that was unique: it's peppered with fat little goats, and because there is a scarcity of flat land, some of the holes intersect others. So after teeing off, walking to your ball can be hazardous. Les says he does have "one account left, in Phoenix. They've threatened to ask me out. If they ever do, I'll bring my stick," and we'll play a round.

Two of our former classmates are members of the San Diego MIT Club: **George Hatch** and **William Hawks**. . . . Christmas news from Marjorie and **H. William Parker** in Bella Vista, Ark., where they have been for 16 years—long enough for the imported maples to have displayed a lovely foliage last fall. This, of course, involved raking up leaves for the mulch pile. Bill and Marge made their veggie and flower gardens smaller to cut down on chore time. They were amazed when the glad and dahlia bulbs they did "not take up last winter came up and bloomed better than ever, and to make things really good, the woodchuck abdicated."

I regret to report the deaths of two '35ers: **Gale Forsen** on May 27, 1992, and **Dr. Frederick F. O'Brien** on October 29, 1992. . . . Gale lived in Omaha, Neb., at the time of his death, and at the time of our 25th Reunion he lived in Munsonville, N.H. If you have any information about him, please mail it to me. . . . Fred was a general practitioner and ophthalmologist in Cohasset, Mass., for 25 years and died in Scituate, Mass., after a long illness. He was Plymouth County medical examiner in the 1960s. He was also a member of the Mass. Medical Society and a former president of Theta Kappa Si. He is survived by four sons, Frederick, John, Mark and Joseph; two daughters, Gail Ann Houlihan and Carmeline; and eight grandchildren.—**Allan Q. Mowatt**, secretary, 715 N. Broadway, #257, Escondido, CA 92025

36

Continuing with items gleaned in the hurricane roundup. . . . **Del Campbell**, Course X, in Tampa, only heard thunder, no rain. He retired there after 21 years with Monsanto in St. Louis, where he developed means for large-scale production of new chemicals and drugs. Still vivid in his memory is the assembly, under fire, of a "Treadway" bridge—stout enough to carry tanks—across the Rhine at Düsseldorf. He was captain of the combat engineers assigned the task. . . . **Norm Robey**, also Course X, in Coral Springs, is active in a "Young at Heart" fellowship, which sponsors arts, crafts, and bridge for seniors. Under the name of Shepherds' Centers of America, it has grown to 85 chapters nationwide. . . . **Harry Easton**, Course II, in Punta Gorda, recalled his early years in Cambridge when he was manager at the Baker chocolate plant and saw much of Institute activities. And who can forget that unique aroma in our nostrils when the wind was wrong—a marvelous combination of chocolate and Lux! . . . **Marie and Warren Dannenberg**, Course VI, returned to their Sun City home in October after their usual five months at Dennisport. He retired in 1978 as a VP of Charles T. Main Co., where his field was design of large power plants. **Frank Parker** was a colleague, and **Dick Patterson** was a friend in related business.

Pat Patterson reports on October 24 mini-reunion hosted by President **Alice Kimball** and her daughter **Martha** at West Hartland. The weather—much rain, so no walk-around-the-pond. Attendance was good: the **Arnolds**, **Assmanns**, **Bordens**, **Dentons**, **Doggetts**, **Grossmans** and **Pattersons** with **Marcia**. Regrets were received from the **Peter-sons** (Larry has had more surgery and cannot drive), the **MacKros** (Augie was housebound after a cataract operation on his one good eye), the **Shainins** (traveling to Brussels), the **MacAdams**

(on a trip to Alabama), the **Thorntons**, and the **Vonneguts**. **Henry McGrath** was visiting his daughter in the Adirondacks, but was unaware of the reunion date until it was over. Last August, Henry collaborated with Professor John Happel, '29, on "Adventures in Coal, Oil, and Gas" in a special issue of *Chemical Engineering Communications*, at \$155 a copy!

Peg and Fletch Thornton went on a Smithsonian tour to Yorkshire, England, in August. He still golfs but has given up skiing. . . . **Herb Borden** continues very active on the sax and clarinet with four different bands and orchestras. . . . **Dick Denton** expects to visit **Harry Foster** when he and Virginia travel to Hawaii this year. Dick responded to my July 1992 report on Harry: "He and I go back a long time. My earliest recollection is of a skinny, wiry specimen who shinned up a 50-foot flagpole to release a fouled halyard at Scout camp. After graduation, we met again in 1941 on the ferry from Hoboken to New York City, and the Fosters were visiting us in Mountain View, N.J., when word came over the radio that Pearl Harbor was attacked. In the 1950s, we both had business that exhibited at IEEE shows."

Don Spencer reports the death of **Kristian Ostby**, who was his roommate in the old graduate house. Kris, a graduate of the Royal Norwegian Naval Academy in 1923, got his SB with us in Course XVI. He transferred from the Navy to the Norwegian Air Force during World War II, and was air attaché in Washington from 1944 to 1947. Don saw him there but lost track after Kris returned to Norway. Our alumni/ae directories show no address since 1967, and after my visit with Don in September, he reached the Norwegian Military in Oslo and learned that Kris died in 1981 in his 81st year.

Another late report came on a Hurricane Andrew follow-up call (February/March Notes). I reached **Bernie Schulman's** wife, Sylvia, only to learn that he had died May 21, 1974, of a sudden brain tumor at age 60. Bernie was Course XV, and after graduation he returned to Akron to run a large family business in commercial linen supplies. Sylvia told of his being president of five charities and the Akron Art Institute for several terms, and of their being wine and dined at domestic and foreign museums when they traveled. "He was a wonderful, sensitive man with keen appreciation of the arts." She was on a trip through southern Europe and the Mideast during the hurricane. She continues the residence—undamaged—at 2850 North Palm Aire Dr., Pompano Beach, FL 33069.

An obituary news clip tells of **Donald Thompson's** death at home October 10, 1992, in Winter Harbor, Maine. He was Course V, and when **Towers Doggett** visited him prior to our 50th Reunion, Don mentioned his acquaintance with **Alice Kimball** in chemistry, and dating with **Phyllis Needham** (deceased 1955). After graduation he practiced research chemistry at U.S. Rubber, was a Navy lieutenant in World War II, and after 28 years at Du Pont, Wilmington, retired as assistant research director in 1974. Along the way he wrote numerous American Chemical Society papers and two books on elastomers that were translated into 10 languages. Attempts to reach Don's family were unsuccessful, and wife Marguerite was in a nursing home in 1986. Mail to Box 125, Winter Harbor 04693 probably is forwarded.

A recent gift to Tech in memory of **Ira Hochberg** from his widow Sara told of his death June 2, 1991, of a massive cerebral hemorrhage. Ira was Course VI, and on the telephone Sara told of his many years of electrical engineering at Boston Navy Yard before retiring in 1973 and his long activity with the American Jewish Congress. Then he took up teaching at Devotion School in Brookline and making hi-fi recordings for gifts to friends. Son David practiced dentistry with the military in Viet Nam; son Jay, with a Tufts degree, is in civil engineering. . . . Cheers and a toast to the lives of Kristian, Bernie, Don, and Ira!—**Frank L. Phillips**, secretary, 1105 Calle Catalina, Santa Fe, NM 87501, (505) 988-2745; **James F. Patterson**, assistant secretary, 170 Broadway, Pleasantville, NY 10570, (914) 769-4171

37

Joan and Bob Rudy and **Rose and Bob Thorson** shared a delightful evening as guests of Marge and **Dick Young** and **Ruth and Phil Peters** at Fox Hill Village, Westwood, Mass., where the Youngs and Peters reside. A tour showed Fox Hill Village to be very impressive with its many conveniences, layout, beautiful apartments, and elegant dining room. The evening was spent dining and catching up on recent travels and news. Members of the Council of the Arts at MIT, Joan and Bob were to attend a meeting the following day. The council is a volunteer group of alumni and friends established to support the visual, literary, and performing arts at the Institute. (For more information, call Mark Palmgren, director, at (617) 253-4005.) The Rudys have established the "Richard Price Rudy," '68, Memorial Fund" for drama and theater (an area in which their son Rick was active during his five years at MIT). The Peters had returned from a trip in September to Eastern Europe, where they visited Vienna, Prague, Dresden, Meissen, Torgau, Wittenburg, and Berlin. Afterwards they went to Dillenburg, West Germany, Phil's ancestral home, where he successfully traced forebears back to 1700. They spend most of their time at their Jackson, N.H. home, but enjoy visits to their Fox Hill Village apartment. Golf is still their fun outdoor sport. The Youngs look fit and recently joined the Brae Burn Country Club in Newton, Mass., where Dick continues to lower his golf handicap. The Thorsons still reside in Winchester, Mass., and continue chasing the little golf ball at Winchester Country Club.

Reland Westgate is still working at XYLO in Savannah, Ga., making wood (hardwoods, exotics) picture frame moldings. He writes, "Come visit us! Just a mile from New Bridge (the Silver Gate of the South) and a front row seat for the '96 sailing Olympics!" . . . **Len Seder** visited Israel in November, where he attended meetings with a quality-control group he had established and then visited his daughter and her family. Len has agreed to share the class secretary duties and will occasionally write the class notes.

Received the following update from **Arthur York**. "I've been remiss about keeping in touch with MIT classmates. Although I started out studying to be an electrical engineer, I moved over to Course IX and took a technical journalism option. So, I've ever since been an odd bird among the scientists and engineers. I spent an interesting and rewarding career in corporate public relations, mostly with Uniroyal, where I rose to the office of director of corporate communications. About the time that Uniroyal self-destructed by selling off its various divisions to raise funds to pay back the junk bonds it had sold to fend off a takeover threat from Carl Ican, I took early retirement and started my one-man counseling and freelance writing service for corporate clients. This has been going on for the last 15 years—an interesting, and sometimes rewarding, second career. I'm married, but live separately from my wife. I have three daughters, including twins, and six grandchildren, including twin granddaughters. Thanks, Bob, for asking for information about me." (Classmates, take note and bring us up to date on your activities.)

George DeArment retired from Channellock, Inc. in 1981. He is director of the Meadville Area Recreational Authority, still plays golf, and lists his other activities as needlepoint, engraving, and skeet shooting. He and wife Janet spend their winters at 10A Turtle Creek Dr., Tequesta, Fla. . . . **Richard Fowler** is resident coordinator for the Foundation for Advanced Research/Medical Sciences. He is retired from GWU, Washington, D.C., where he was an associate professor in medicine. He and wife Mavis reside in Easton, Md., and his main interests are sailing and "keeping ahead of politicians."

It is with sadness I report the death of **Eugene Cooper** on November 19, 1992 (see January issue of class notes). . . . On September 5, 1992, **Carl Hillyer, Jr.**, passed away. Carl began his career at the Fairfield Camera & Instrument Co. in New York. In

1945 he founded the Hillyer Corp. in New York and was president from 1945 until his retirement in 1982 as chair of the board. He was an industry pioneer who developed the first numerically controlled drilling machine. Surviving are his wife, son, and two grandchildren. Our condolences to the Cooper and Hillyer families.—**Robert H. Thorson**, secretary, 66 Swan Rd., Winchester, MA 01890; **Leonard Seder**, assistant secretary, 1010 Waltham St., 342B, Lexington, MA 02173

38 55th Reunion

Lou Bruneau has passed on the following notes he received with Class dues. . . . **Clark Robinson** reports that in 1991 he retired as editor of the *Soviet Journal of Nuclear Physics* and has now moved to a smaller place in the mountains. . . . **Don Mitchell** retired from General Foods in January 1981. He now enjoys gardening, golf, and travel—Elderhostels.

Ira Lohman writes: "Louise and I sold our house in Saratoga, Calif., a year ago and moved into the Forum at Rancho San Antonio, a new retirement community in nearby Cupertino. We are enjoying the many fine people we've met here and Louise is pleased with her retirement from KP. We adjoin a splendid wilderness-type park and have a good view of the Santa Cruz mountains from our living room, but still haven't found a way to get two autos and my shop and darkroom into a one-car garage. Both of us are looking forward to our 55th reunions in June and hope we can find a way to resolve the MIT-Wellesley scheduling conflicts." . . . **Sol Kaufman's** family has increased by a new grandson named Daniel.

King Coombs writes that unfortunately his wife, Kathie, is in a nursing home with Alzheimer's. . . . **Russ Coile** is still working (half-time) at the Pacific Grove Fire Dept. as "disaster coordinator." California is not only Disney Land but also Disaster Land. . . . **Wes Cilley** now has nine grandchildren and is active in SCORE and treasurer of the local Rotary Club. He is planning a third trip to Hong Kong. . . . **Jack Chapin** has finally become a grandfather (must be the last) to Joey X. Chapin on June 23, 1992. . . . **Matt Abbott** writes "Jean and I have enjoyed good health since my retirement in '78. Now wintering in Venice, Fla., and summering in Chatham, Mass. Best regards to all."

Dick Henderson and Ginny are celebrating their 50th wedding anniversary. . . . **Sam Steere** writes: "On June 3 I plan to swear my youngest grandson into the Regular Air Force as a 2nd lieutenant, USAF. He is currently completing his final year at the Air Force Academy at Colorado Springs, Colo. . . . **Pearl Rubenstein Lichtenstein** reports: "We have five grandchildren, all boys. I am active in politics, a foreign-policy discussion group (Great Decisions), and the piano—four hands or small chamber group."

With regret I must report the passing of five of our class. . . . **Francis Fisher XV** of Eastham, Mass., died May 30, 1992. . . . **Sidney Kodama** died April 30, 1992. According to our records, he was active at MIT in the Radio Society, was dorm floor chair his senior year, was for 40 years or more a radio ham, and served in World War II from 1941 to 1946 and in the Reserves until 1952. Upon graduation he joined American Cyanamid as a research chemist and retired in 1972 as the result of a stroke.

Anne S. Mowat died November 11, 1992. At MIT she worked on *Technique* and was VP of the Chemical Society. She had worked first as a chemist at a small company, then at the Harvard Medical School. In 1960 she worked in oceanography for the Lamont Geological Observatory and then the Alpine Geophysical Association. From 1970 until retiring in 1976, she served as sanitary chemist for Rockland County Sewer District. She was an enthusiastic supporter of MIT, serving the MIT Club of Cape Cod with diligence as a member of its board starting in 1981, secretary-treasurer from 1983 to 1985, and VP from 1986 to 1987. She compiled the *History of the MIT Club of Cape Cod* last year in celebration of the club's 15th anniversary.

sary. Among her local activities, she was active with the Friends of Hyannis Library.

Wilbur Rice died of leukemia in December at his home in Sanibel, Fla. He was very active as a student at MIT, including manager of Crew and member of the Crew Honorary Society, as well as being active in advanced ROTC. He served in World War II from 1942 to 1946. At one time he was president and owner of three manufacturing companies, making wire, farm machinery, valves, and locomotive parts. In 1976 he retired as president of Flomatic Corp. in Hoosic Falls, N.Y. He served as president of Bennington Aviation and president of Bennington County Industrial Corp. . . . **Jim Spartales** died of a stroke September 17, 1992, at Wilmington, Del., Hospital. He had retired as manager of product development from Campbell Soup Co., was an emeritus member of the Institute of Food Technologists, and was a member of the Hellenic Society and University Club of Philadelphia. —**Don Severance**, secretary, 39 Hampshire Rd., Wellesley, MA 02181; **Ed Hadley**, assistant secretary, 50 Spofford Rd., Boxford, MA 01921

39

George Beesley and **Ruth Pitt** are planning the 1993 Reunion Week program for the Cardinal and Gray Society. Five thousand MIT alumni/ae, including all '39ers, are members. George and Ruth welcome ideas for the program and volunteers to share the fun and benefits. . . . **Bob Touzalin** and **Aletta** were joined by **Fred Cooke** and **Eugenia** for two weeks of canal boating in England last summer. Bob and Aletta are chairing the '39er portion of the "Reunion of MIT Survivors" in Naples, Fla.

Bill Pulver and **Adie** were among MIT and Wellesley alumni/ae for a sunset cruise on the Connecticut River and expect to golf at the Naples mini-reunion. If encouraged, Bill will share some good golf stories. . . . After some bone setbacks last summer, **Dodie Casselman** is comfortable in Fort Meyers, Fla. It's possible that **Bill Murphy** and **Anne** and the **Pulvers** will drive by after Naples and stimulate reminiscing as they overlook the soft white sands of Florida's west coast.

Bill Brewster gave the main eulogy at the **Gordon Pope** memorial service November 21, 1992, in the MIT chapel. At a reception in Boston later the same day, Lucille Brewster suffered a heart attack and expired suddenly. The only positive aspect was that her condition did not result in prolonged disablement. They had been married 47 years. Bill's many friends extend their sympathies.

Class President **Seymour Sheinkopf** and **Sylvia** toured the Southwest. At Santa Fe they visited **Leo Kiley** and **Luna**, and on the homeward leg they visited **Mel Falkof** and **Lucille** at Highland Park, Ill. . . . the Kileys had three careers—so far, that is. Leo earned rank of brigadier general in 1965 and was awarded the Distinguished Service Medal and two Legions of Merit before retiring in 1969. Leo's second career was with General Electric, developing nuclear weapons in Florida for nine years. Now Leo is VP of Los Alamos Technical Associates and resides in Santa Fe. . . . **Mel Falkof** directed engineering, construction, and operation of supermarkets for 27 years and now consults in the field. **Mel** and **Lucille** traveled in 40 countries and worked with the International Executive Service in Costa Rica and Egypt.

Seymour and **Sylvia Sheinkopf** returned to Burtonville, Md., in time to enjoy a '39er mini-reunion hosted by **Bill Wingard** and **Anita** and attended by **Ernie Kaswell** and **Yolande**, **Sid Silber**, and **Art Zeldin** and **Helen**. . . . **Bill** and **Anita's** two sons now manage the high-tech machine works **Bill** founded. We hope **Bill** and **Anita** will start working fewer hours in their highly competitive industry. . . . **Art** and **Helen** retired and live in Silver Springs, Md. **Art's** career included managing the \$300-million reconstruction of a major U.S. copper smelter for Kennecott in Utah and contributing to metallurgical engineering professional societies and civic projects.

After several thousand miles of traveling, **Seymour** and **Sylvia** happily celebrated their 50th wedding anniversary. . . . Five hundred miles to the north, **Manning Morrill** and **Connie** also celebrated their 50th anniversary. . . . And 3,000 miles to the west of all that there was no report that either **Sylvia** or **Connie** said: "We've been married for 50 years and sometimes it only seems like 500!" . . . **Connie** completed a screenplay and is encouraged by experts to offer it to movie pros.

Barry Graham and **Jean** sold their home, **Onnalinda**, and settled into a quiet part of Toronto. Their new home is near shopping and two blocks from a ravine of the Don River Valley where **Barry** can walk for miles on beautiful trails. . . . **Dick Christie** and **Barbara** report from Minnesota that they completed travels in the Far East before vacationing last summer at the Boulders.

John Alexander and **Nancy** are back from a Mediterranean cruise on the 1,500-passenger *Star Princess* liner. They toured on shore at Odessa, Rhodes, and Venice. **Hilda** and **I** look forward to joining them and **Jim Barton** and **Mary** in January for a two-man musical at Seattle's new museum of flight. Subject to vagaries of the jet stream and its surface-level blizzards and rainstorms, we may see a bit of a supersonic A-12-SR71 now retired and mounted outside the museum. Either this plane, or one of its 23 sisters, set a record speed of 68 minutes flying time at an elevation about eight miles from Los Angeles to Washington, D.C.

Morrie Nicholson and **Norma** are active in St. Paul, Minn., where **Morrie's** volunteer activities now include reworking the exam presented to applicants for license to practice professional metallurgical engineering. . . . **Gus Hunnicke** reports customers of his Precision Timing Co. keep his appointment calendar filled. Congratulations, **Gus**, for being a successful entrepreneur. . . . **Sears Williams** replaced one hip damaged by a fall. Convalescence progresses and **Sears** is already driving in the St. Louis area. —**Hal Seykota**, secretary, 2853 Claremont Dr., Tacoma, WA 98407

40

Class president **Norm Klivans** received a letter from **Robert Miller** of Leesburg, Fla., in which he says, "Sorry to have to cancel out on the January 1993 reunion, but it turns out that I will be involved in an IESC tour of duty in Mangalore, India. (I leave Orlando for India on Friday, November 13. Maybe this 'lucky' day will cancel out my celebrating two Halloweens last October 31—one in Christ Church and Auckland, and then again on the very next day, also October 31, in Honolulu and Los Angeles.) My assignment is for one to three months, so I don't really know when I will return. If it precedes January 4, I may give you a call. In any event, I hope that you all will have a very delightful reunion, and I'll be thinking about you."

Paul Bollerman writes from Englewood, N.J., "We'll soon be returning to Florida for the winter and look forward to the mini-reunion in Naples." . . . **Paul Lamson** telephoned to get information about his class dues. He told me that he has been retired for about three years and is still in his house alone. . . . **Alvin Gutttag** sent his annual "Seasons Greetings" card from Course V, MIT, '40.

A note from **Dick Babish** reports the death of **Maxwell Small** of Bellport, N.Y., on July 1, 1992. There is no further information. . . . On November 4, 1992, **Stanley Snowdon** passed away suddenly in Arlington, Mass. After receiving a bachelor's degree from MIT, **Stan** received a PhD from Cal Tech. He was a research physicist at Fermilab National Accelerator Laboratory from 1967 to 1987. Thereafter, he was a consultant physicist. . . . **Leonidas Keches** of New Bedford, Mass., died November 9, 1992. **Leon** worked in the golf division of the Acushnet Co. as a chemist and director of R&D until his retirement in 1981. Thereafter, he was a consultant to Acushnet. He was a member of several organizations, including the MIT Club of New Bedford.

From Dayton, Ohio, **William Hagenbuch** writes: "Thanks for all the info on the Florida mini-reunion. Sounds like fun, but I won't be able to make it because my doctor says it's too soon for me to kick up my heels after the installation of a new joint in my left hip. All is going well, but healing takes time—and is a BORE! Tell everyone hello!"

John Casey sent a copy of the front page of a recent issue of *The Wings Club* bulletin featuring a picture in which he is included. The caption says that the club president addressed the Annual Dinner crowd at the Waldorf Astoria, saying, "The recipients of our 1992 Distinguished Achievement are men whose special skills, knowledge, and imagination catapulted aviation into its predominant position in the world's transport and military realms." John's letter says that the picture is of "seven ancients... mostly noted for extensive foreheads. Fortunately, I am in the back row and hopefully hardly recognizable. Best wishes for a wonderful Christmas and an exciting 1993." John also asked for my fax number. Sorry, but I don't have one.

Your letters and calls make the column. Keep them coming to—**Richard E. Gladstone**, secretary, 1208 Greendale Ave., Needham, MA 02192, (617) 449-2421

41

Bob (Wilson) Blake, left DC environs and moved from Falls Church to Richmond, Va. in May. He writes, "Joined the Virginia MIT Club, Richmond Ski Club, Sandy Bottom Yacht Club in Deltaville, and church. Moved my sailboat down the bay from Annapolis. Stay in touch with, **Albert Bowker**, **Walt Keith**, and **George White**. New Address: 1801 Cambridge St., Richmond, VA 23233, (804) 740-2604." ... Congratulations to **Stan Backer**, professor of mechanical engineering emeritus and senior lecturer at MIT, who has been named the first winner of a prestigious new award, the Carothers Medal, given by The Textile Institute. The medal, established this year with funding from Du Pont de Nemours, Inc., honors Wallace H. Carothers, who discovered nylon at Du Pont in 1937. This discovery laid the scientific foundation for many of the synthetic fibers of today. The Textile Institute said that Backer, through research, teaching, and nearly 40 years as a consultant for Du Pont, "has contributed greatly to the utilization of such fibers in textile materials. His important research includes seminal work on false twist texturing, on the mechanics of yarns and fabrics, on the structure and durability of marine ropes, and on the utilization of synthetic fibers in the reinforcement of concrete." Stan holds three degrees from MIT and began his career in textile research with the U.S. Quartermaster Corps before joining the MIT faculty. He has been a member of the Textile Institute since 1947 and was elected to the National Academy of Engineering in 1992.

Malcom (Tom) Dodd writes, "Laryngectomy on July 31 caused me to miss celebration of the 50th anniversary of the first U.S. jet flight at Edwards Air Force Base. Children, friends, and relatives helped celebrate our 50th wedding anniversary on June 26." Tom's participation in the original flight and the construction of EAFB was recounted in the October 1992 Class Notes. We wish Tom a speedy recovery.

Notes from Helen Davies and Fred Davies, Jr. to the Alumni/ae Association, report the passing of **Fred T. Davies** in Sargentville, Maine, on September 19, 1992. Fred graduated with an SB in naval architecture and marine engineering. At MIT, he was president of the Chi Phi fraternity. He had been VP of the Hightstown Rug Co., Hightstown, N.J., and more recently worked in the chemical engineering department of Princeton University. He leaves his former wife, Helen T. Davies, of Cranbury, N.J., four sons, and ten grandchildren.

Douglas Watson died on October 29, 1992, at his home in Brookfield Centre, Conn., after a short illness. At MIT he was a member of Theta Chi fraternity, graduating in civil engineering (building

engineering and construction). His career, as a self-employed professional engineer and land surveyor was conducted in his home town of Brookfield Centre, Conn. He was known as a consultant and a designer of local buildings, a former Boy Scout leader, a longtime active member of the Congregational Church of Brookfield, and a resident of the town for more than 60 years. He leaves his wife Jeanne Gesell Watson, a daughter, a sister, a sister-in-law, and several nieces and nephews. ... The class expresses sympathy to the families of these departed classmates.

The 50th Reunion Yearbook was truly outstanding. All attendees were particularly interested in the lives, activities, and philosophies of their classmates as expressed in the submitted biographies. Since that time, a search has been conducted for biographies sent to MITAA too late for inclusion in the original document but planned for issue as a supplement. These biographies are now presumed to be lost.

In April 1992, extracts of biography copies retained by two local classmates, **Chet Hasert** and **Bob Youngquist**, appeared in these notes. The extract from the biography retained by another local classmate, **Sterling Ivison**, appears below. Other classmates who did all that work for naught, please send me your retained copy or any similar material. Extracts will appear in these notes from time to time.

Sterling H. Ivison, Jr. and his wife, Katharine, live in Chevy Chase Md, (winters) and Martha's Vineyard (summers). They have two children and three grandchildren. From 1941-1970, he was a U.S. Navy officer in production management, procurement, and a controller in naval aviation, retiring as a captain and assistant budget officer of the Navy with a Legion of Merit and Navy Commendation Medal. From 1970-1983, he obtained a PhD in business administration at the American University, Washington, D.C., became a member of the faculty, finance deputy chair, acting dean, and retired as associate professor emeritus. From 1984-1988, he was VP/finance for a small local manufacturing firm until the owner/inventor consumed all his funds in patent litigation and ended up in Chapter 11 bankruptcy. Since that time, Sterling has been in full retirement.

Sterling was awarded the Bronze Beaver by MIT for his volunteer activities over the years—educational counselor, fund raiser, telethon organizer, and president and treasurer of the MIT Club of Washington, D.C. When not volunteering for MIT, he's been president of a citizens' council, president and treasurer of a summer chapel, yacht club commodore, estate executor, and trustee of trusts. His many hobbies include sailing and cruising Nantucket Sound and Chesapeake Bay. He walks for health and is a handyman, gardener, plumber, and electrician.

Sterling comments, "Life has been good to me. Blessed with a loving wife of 43 years, two fine children (daughter, Phi Beta Kappa, and son, Du Pont plant manager), three grandchildren as our immortality. Challenging assignments in the Navy, academe. Many good friends and scores of good acquaintances. Surely goodness and mercy have followed me all the days of my life."—**Charles H. King, Jr.** secretary, 7509 Sebago Rd., Bethesda, MD 20817, (301) 229-4459

42

Before we get to the obits, there's good news! Our class received a 1992 presidential citation "for their 50th Reunion and Reunion Book effort." So our thanks to **Jerry Coe**, Reunion Committee chair; to **Lou Rosenblum**, the Reunion Book editor; and to all of you who helped to get the jobs done. ... **Bill Denhard** reports that the class treasury is nicely solvent, having cash and an inventory of year-books. Anyone wanting a book, send \$15 to Bill at 25 Springvale Rd., Reading, MA 01867. ... Our class was well represented at the 20th Annual Meeting of the MIT Council for the Arts by Toni



What exactly is it???

Founded in 1985 at the prompting of Max Seltzer '18, the Society honors those MIT alumni/ae who have reached the milestone of their 50th class reunion. All alumni who have passed that milestone are members.

Cardinal and Gray provides Institute-related intellectual and social activities more frequently than the five-year class reunion cycle permits. All members of the Society are invited to a reunion during Alumni/ae Week each June—a yearly opportunity for those who share similar experiences to meet once again and "drink from the fire hose."

See page MIT 13 for the Cardinal and Gray ad giving details of the 1993 reunion. Alumni/ae living in New England, New York, and New Jersey will automatically receive a reunion registration package. If you live outside that region and would like to attend, be sure to check the ad for details about how you can register. (And DO register. We want to be ready to welcome you to campus.)

and **Jack Cantlin**, Rhoda and **Alan Katzenstein**, Ellie and **Harvey Kram**, and **Bob Greenes**.

The Class of '42 lost an outstanding leader and a prodigious worker with the death of **Jack Sheetz** last November. (Be sure to read the obituary in the *Review*, February/March '93, p. MIT 17.) Our sympathy to his wife, Linda, and to his family.

Too many obits this month. ... **John Hinchman**, Course II, died in Groton, Mass.; **Dan Grady**, Course I, in La Jolla, Calif.; **Dick Little**, also Course I, in Saint Albans, W. Va.; and **Jack Uhlemann** in Lake Forest, Ill. Our sympathy to all of their families.—**Ken Rosett**, secretary, 281 Martling Ave., Tarrytown, NY 10591

43

50th Reunion

This month I have—mirabile dictu—almost more news than I can handle. In the spirit of "waste not, want not," however, I am submitting all of it.

First, I must sadly report the inevitable obituaries. ... A routine check of the records showed that **Bob Rumsey** (Course XV) died August 19, 1989, in Buffalo, N.Y. He is survived by his widow, Florence. ... **Don Powers** (Course VI) passed away March 29, 1992, in Orlando, Fla. He was a member

of Chi Phi Fraternity, a ham radio operator, and an electronics group manager at Martin Marietta. Brother Davie (also MIT) jotted down and sent along some warm memories of Don. Unfortunately, I haven't the space for them in detail, but I'll mail a copy to anyone requesting it. We extend our condolences to Florence Rumsey, Virginia Powers, and the other members of their families.

We now go to the honors list. In November 1992, William Jewell College, Liberty, Mo., awarded **John G. Linvill**, of Portola Valley, Calif., an honorary ScD for his career accomplishments in academic science and technology. As a further tribute, the school's new White Science Center includes the Linvill Computer/Electronics Laboratory. John received a mathematics degree from William Jewell in 1941, then went on to acquire three degrees in electrical engineering from MIT. He served on the Institute faculty and at Bell Telephone Laboratories before joining the electrical engineering faculty at Stanford in 1955. Before retiring in 1990, he chaired the Department of Electrical Engineering, served as associate dean of the School of Engineering, and helped to found and became director of the Center of Integrated Systems. In 1971 he invented the Optacon, a reading aid for the blind, considered one of the most significant new technical products of that year. He retired with the title of Canon USA professor of engineering, emeritus. John is a member of the National Academy of Engineering and the American Academy of Arts and Sciences. He is a founder and current board chair of Telesensory Corp.

In a bygone issue of class notes I mentioned a book, *Nahant on the Rocks*. Author **Stanley C. Patterson** (Course VI) reports, "I am working on a biography of Frederic Tudor called *The Ice King and His Court*. I will look for another plug when it is published."

From Salt Lake City comes word that **Dick Zeamer** is still busy with his small consulting business, Applied Science Associates (structures, machines, heat exchangers, rockets). Another major interest is history. He belongs to several engineering and history societies, and has authored a number of papers dealing with historical subjects. In spare moments he likes to visit, travel, or camp with family and friends.

A Christmas note from Marion and **Gilbert Monet** in Willow Street, Pa., reports on their 1992 activities. The Monet interest in the arts continues unabated. Marion has gained some renown in eastern Pennsylvania as a cellist, playing with college and community orchestras, local duets and trios, and a quartet at The Lawrenceville School, near Princeton. Gilbert is a student of the piano, bassoon, and bass clarinet, working towards the goal of performing in an ensemble. He is still making sculpture portraits in clay, the latest being of his daughter-in-law, Alice Kay. She and Gilbert's son, David, are both astronomers at the U.S. Naval Observatory in Flagstaff, Ariz.

Calls on behalf of the 50th Reunion Class Gift have turned up some incidental news items. . . . **John M. Miller** (Course V), Cypress, Tex., has retired from the position of technical director, Food Division International, Coca Cola Co. He now operates a travel agency and a restaurant. . . . **Ray Frankel** (Course X) has a Los Angeles address that puts him in the Santa Monica Mountains, overlooking the San Fernando Valley. There he leads an exemplary life amid his own orange and lemon groves. He still works as an investment manager for Clickenhaus & Co., commuting monthly to New York. He recently visited Egypt and Israel.

Speaking of the reunion, **George Freedman** is assembling the traditional souvenir kits for those attending. As mentioned in the letter from El Supremo **Jim McDonough**, contributions are solicited. If you have something to offer, please call George at (508) 358-2350.

To whom it may concern: If you are an alum who is not associated with any class but would like to join '43 so as to attend our Fabulous Fiftieth, call Eliza Dame at (617) 253-8230. She has enormous influence and may be able to change your spots.—**Bob Rorschach**, secretary, 2544 S. Norfolk, Tulsa, OK 74114

44

On November 30 and December 1, 1992, the first planning session for the 50th Reunion was held in the Faculty Club at MIT under the direction of **Ed Eaton**, class president, with the assistance of the Alumni/ae Association. Present were **Norm Beecher**, **Les Brindis**, **Lou Demarkles**, **Ed Eaton**, **John Gardner**, **Ed Roos**, **Norm Sebell**, **Bob Smith**, **Harry Turner**, **Stan Warshaw**, and **Larry White**. The Alumni/ae Association was represented by **Beth Garvin**, **Eliza Dame**, **Mary Burke**, **Joe Collins**, **Diana Strange**, **Frank McGrory**, and others. The order of events and all major items were covered and a preliminary schedule was drawn up. The group will meet again on March 1 and 2, 1993, to go into all the details and start the information flowing to all the class.

We regret to report the passing of two classmates. . . . **Charles L. Sollenberger** died June 19, 1992, in Egg Harbor, Wis. No details are available at this time. . . . **Robert H. Barnaby** passed away November 12, 1992, in Cotuit, Mass. Attending the memorial service on November 19, 1992, were five classmates: **Ed Ahlberg**, **Frank Chin**, **Andy Corry**, **Lou Demarkles**, and **Larry White**, along with their wives. The class extends its sympathy to his wife, Jane, and daughters Ellen, Sue, Carol, and Janet.

Ray Froddy sends word from Fremont, Mich., that he is still enjoying retirement as a nature photographer and an environmental activist. . . . Belated best wishes to the class for a healthy and happy new year. Please send news.—Co-secretaries: **Andrew Corry**, P.O. Box 310, W. Hyannisport, MA 02672, and **Louis Demarkles**, 77 Circuit Ave., Hyannis, MA 02601

45

Please send news for this column to: **Clinton H. Springer**, secretary, P.O. Box 288, New Castle, NH 03854

46

Not as busy with the Christmas notes that usually come this way, but I'll stick through. . . . The two best were from **Ken Davis** and **Tom Williams**, both who wrote to say they hope to come out to Colorado snow country this February. In addition, they are both planning to ski at Copper Mountain, one of our nicer places. I'm tempted to call them and have them meet on the same dates. Ken lives in view of Washington Square in downtown New York, while Tom lives in Potomac, Md.

A really pretty family film was sent here by **Norm Sas**. Among daughters and sons lay their first granddaughter. The Sases spend half a year in Alpine, N.J., and the other in Vero Beach, Fla. Norm's off "tennis for a while but it sure has helped his golf game." (Did I read that right, Norm?)

Got a really nice card (full of squirrel, rabbit, and racoon) from **Bob Zucker** with news about trips to Binghamton, N.Y. (to celebrate his sister-in-law's 50th anniversary); a two-week cruise to the Scandinavian capitol, with stops in St. Petersburg; and Bob's 50th reunion at his "prep school" (in Mount Vernon, Bob?), where the class was a little over 30. Anyhow, it was a good year.

Another nice card from **Mario Vinci** says he's looking toward his 50th Brooklyn Tech High School reunion this year, along with **Bob Wentch** and another V-12er, and with **Gene Wroblewski** and **John Bon Signor**. . . . Yes indeed, this has to be the year for 50th high school reunions. . . . I'll await a letter from **Jim Chabot** to find if he's going to his 50th at Gardner (Mass.) High. . . .

I'll end with a notice sent by the Alumni/ae Association from **Dr. John L. Bateman** (from New York), who tells us that he has "finally convinced my medical colleagues (a few, that is) that medicine is one of the branches of engineering. Headed for retirement

from nuclear medicine in four to five years—or when I can't stand up anymore, whichever comes first!"

Th-th-that's all folks.—**Jim Ray**, secretary, 2520 S. Ivanhoe Pl., Denver, CO 80222

47

First, let me correct an error in the Nov./Dec. column. **Martha Giltinan**, who was with **Alex Giltinan** at Tech Night at the Pops during our 45th, is Alex's daughter, not his wife! Martha is an Episcopal priest; her church is St. Andrews in Ayer, Mass. Alex's wife, Carter, could not attend our reunion for business reasons—she runs a garden center and June is obviously a busy time. She says she will retire before the 50th, however, and will come to that one with Alex. Besides Martha, Carter and Alex have two sons. Bill is a jazz musician in Charlottesville, Va., and Sandy (Alex, Jr.) works as a carpenter in the summer in Ketchum, Idaho, and as a heli-ski guide in the winter. Martha's son, T.A. Taylor, is an actor in Dallas.

Lori and Hugh Flomenhaft spent September in Spain—half of it touring the major cities with a side trip to Morocco and the other half at a resort on the Costa Del Sol. They found everything was much more expensive than four years earlier—then the dollar bought 170 pesetas, now only 90! It cost them about \$60 to fill the tank on their rented car! In Hugh's words: "Morocco was interesting from a historical viewpoint, but pretty depressing otherwise. On the other hand, Spain was great fun and surprised us at how modern it was. The major historical attractions in Madrid, Segovia, Cordoba, Seville, Malaga, Granada, and Toledo were certainly impressive, but after all the detailed lectures by the guides, we had cases of 'data overload.' We got to the Expo in Seville for one day and found it to be below the standard of other expos we have been to, with long waits to get into the best pavilions. The visit to Gibraltar was a highlight of the trip, with its unique topography, duty-free status, a mixture of cultures, and the Barbary apes on the 'rock.'"

"The Spanish are very social people with a very lively nightlife. Everyone seemed to be out walking in the evenings, going to the tapas bars (which we did not find appealing), and finally going to dinner by 9:30 or later. Even the children were out that late. The restaurants opened at 8:00 or 8:30, but only the Americans were there then. We did not find the food to be very impressive, except for the excellent red and white gazpacho soups, and the Spanish wines, especially the Rioja."

David M. Himmelblau, the Paul D. and Betty Robertson Meek and American Petrofina Foundation Centennial professor in chemical engineering at the University of Texas at Austin, has been named recipient of the Founders Award given by the American Institute of Chemical Engineers. This award is presented annually to recognize outstanding contributions in the field of chemical engineering. Professor Himmelblau was honored for his outstanding contributions in fault detection, optimization, and process-control research and education. He joined the UT faculty in 1957 as an instructor and became a full professor in 1965. He has held key positions in the AIChE and was president of the CACHE (Computer Aids for Chemical Engineering Education) Corp. from 1977 to 1979. He received CACHE's Award for Contributions to Computing in Chemical Engineering Education in 1979.

One death to report this month: **Samuel Waldstein** died in September 1992. He worked for RCA for more than 30 years as a manager and mechanical engineer. In 1978 he received the David Sarnoff Award for Outstanding Technical Achievement for excellence of team effort in product development. He retired in 1989. He resided in Waban, Mass., at the time of his death. He is survived by his wife, Selma, and his children, Robin, Barbara Schay, and Lynn.—**R.E. (Bob) McBride**, secretary, 1511 E. Northcrest Dr., Highlands Ranch, CO 80126

48

45th Reunion

In December another successful champagne brunch at MIT's Endicott House was enjoyed by the following classmates: Gloria and **Sonny Monosson**, Judith and **Vince Vappi**, Jean and **Milton Slade**, Jeanne and **Jack Juechter**, Agnes and **George Fountas**, Judy and **Graham Sterling**, Nancy and **Don Noble**, Anita and **Verity Smith**, Marge and **Bob Welsh**, Dorothy Seltzer, **Norman Levenson**, Eleanor and **Harold Ottobriani**, **Denny McNear**, Virginia and **George Clifford**, Tel and **Bob Sandman**, **Mike Oglo**, Jackie Hewitt, and **Marty Billett**. After the brunch, Jackie Hewitt described her appreciation at receiving the appointment to the Class of 1948 Career Development Professorship. Jackie is an assistant professor of physics. She and her students are concentrating in three areas: using high resolution imaging to study gravitational lenses, developing techniques of very long baseline interferometry in a search for planetary companions to stars other than our sun, and developing techniques to detect radio transients of astrophysical origin.

Marty Billett, as president of the class, recognized **Harold Ottobriani** for the excellent job **Harold** had done planning and running our 43rd Reunion at Martha's Vineyard. **Harold** was ably assisted by his wife, **Eleanor**, and everyone had an enjoyable weekend.

Our 45th Reunion will consist of three days on Nantucket and two days on the MIT Campus. We plan to go to the Nantucket Inn from May 31 through June 2, 1993, before coming to Cambridge for Tech Night at the Pops and Technology Day (June 4). Two more mailings with additional details are planned. On Thursday and Friday nights, space is available at three hotels and in a dormitory at the west end of campus. Details in the April mailing.

While we were undergraduates, **Frank J. Silvestro** studied mechanical engineering. After attending a seminary and becoming an ordained Catholic priest, he was known as Reverend Dominic Silvestro. Some 20 years ago, he became a Japanese citizen and has a Japanese name, **Shintoku Takayama**. He is pastor of a Catholic Church in Kyoto. . . .

Avrom Handelman started with our class but finished after we did. He is considering attending our 45th Reunion because most of the classmates he remembers are in '48. He lives near St. Louis, and the company he founded and operates makes a mixer that wets dry powders and disperses the wetted powders into liquids. The liquid is made into a fine mist by the design of annular nozzle, and the highly atomized liquid wets the powder at maximum efficiency. If you ever tried to wet out flour in the kitchen, you have seen the problem that occurs in many other applications. Av's product has been used to disperse pigments for coatings and inks, gums for food and building products, starch for food, paper, and textile uses.

His company makes associated equipment for the efficient handling of dry powders. The mixer is related to earlier work that Av did for Monsanto in the dispersing of fine powders into water before dropping the mixture from an airplane to fight forest fires.

Av and I had dinner at Ye Old Oyster House opposite Boston's City Hall while he described what he has been doing since living in the dorms. In 1947 when my sister visited me on campus, he took her out on Saturday night. Av has been a member of the MIT Club of St. Louis.

Barney Devins writes that retirement is not so bad. He is reading Will Durant's 12 volume *Story of Civilization*. He has learned two things: that civilization is merely the interval between ice ages, and Saddam Hussein is a piker compared to the ancients, for brutality and viciousness. . . . **Jerry Blackman** retired from the mathematics department at Syracuse University in 1988. He spends the winters sailing a 45-foot ketch through the eastern Caribbean. . . . **Jim Guida** lives in northern Vermont and is looking forward to the ski season.

Ezra "Bud" Garforth is enjoying retirement in his home on the third fairway of the Country Club

of Charleston, S.C. He is serving his second term as president of the chamber of commerce of Charleston. He is counseling about 15 small businesses for SCORE. His golf handicap is 13. . . .

Fiorenzo Losco is enjoying retirement. He visits eight grandchildren, three daughters, and their families. Golf, traveling, and casino gambling occupy his time. His MIT math courses offer no advantage to his results in gambling. He lives in Voorhees, Nev. Took a 21-day trip through the Panama Canal. . . . **Russell Trimble** retired after 38 years as a chemistry professor at Southern Illinois University. He often taught summer institutes for high school biology teachers and top high school students.

Bev and **Dave Freedman** continue their volunteer effort for the International Executive Service Corp. Their most recent assignment was in the Windward Islands, which include St. Lucia, St. Vincent, and the Grenadines. Dave worked with more than 40 bakers, showing them how to make a profit while paying higher salaries to the workers. He introduced new recipes and more efficient procedures. He taught them how to keep a check on their production and their revenues. He convinced them that silent partners with a hand in the cash drawer could bankrupt their operations. Dave was received enthusiastically and his recommendations became gospel.

Bev spent the days teaching remedial reading. She traveled through the banana country where the children, no matter how poor, arrived at school immaculately clean in their uniforms. They were well behaved. She thinks on occasion the teacher hit a child with a ruler, but, whatever, it worked. Each teacher usually had 50 to 60 pupils. Room lighting was poor, few pencils or paper, shared books—still learning went on. Education is free, and college is free for those who qualify.

The Class of 1948 Student Financial Aid Fund that we created will support the following four students in the 1992-1993 year: **David Underwood**, **Hsin-Chien Tai**, **Jonathan Doan**, and **Leslie Margaret Compton**.

Hsin-Chien wrote to thank our class for her scholarship. She is a senior in chemical engineering, and her research is related to hypercholesterolemia. . . . **David** is a senior in aero/astro, and a project he worked on was sent up in the space shuttle. He plays for the MIT Rugby Club and other intramural sports. . . . **Jonathan** is a senior in physics and was involved in a research project at the laser lab. He is rush chairman, VP, and alumni secretary of his fraternity. . . . **Leslie** is a senior in materials science, and her research project involved testing and analyzing ancient Mexican metal artifacts. Music is a major interest, and she is business manager of the MIT Chorallaries and music chair of her sorority.

John Colton died in Des Plaines in 1987. . . .

Alexander Bagdasarjan died in Belmont, Mass., in October 1992. Alex had been with Artisan Industries for 20 years. . . . **Richard Gaunt** of Lynn Haven, Fla., died in Panama City as a result of an automobile accident. . . . **Edward Farnsworth** died in Bel Air, Calif., in October 1992. He had been an electrical engineer in the Boston area for many years. He and his wife, **Diana**, had been living in California for the past few years. On behalf of our classmates, I extend our sympathy to the families of these classmates.—**Marty Billett**, secretary and president, 16 Greenwood Ave., Barrington, RI 02806. (401) 245-8963

49

When I was married, I failed to send an invitation to one of my closest friends. After much redness of face and getting out a belated invitation by special delivery, airmail, I realized what had happened. I'd been attacked by the list demon: He's the viper who makes you miss someone when you're working from a list.

So what's that all about? It's just that the viper got me once again. I had written an account in the

January 1993 issue of a meeting last August of the Reunion Committee. Those attending, I said, were **Mary** and **Tom Toohey**, **Ruby** and **Len Newton**, **Jean** and **Harry Lambe**, **Eunice** and **Joe Schneider**, and **Roz** and **Stan Margolin**. So? you ask. Well, it's just that **Nell** and I were dining the other night with **Harry** and **Jean Lambe** and **Pam** and **Mickey Ligor** when **Pam** leaned over and, in silky tones, said: "I loved your piece about the Reunion Committee." Spontaneous praise like that always gets to me and I thanked her for her kind words. At this point, **Nell** leaned over to say: "What she really means is: How come you left her and **Mickey** out?" There's just no good answer to a question like that except to apologize profusely and try to blame it on somebody else. In any event, let it here be recorded that **Pam** and **Mickey Ligor** were among the toilers who gathered last August 14-16 at the Stratton Mountain Inn in Vermont to plan the off-campus portion of our 1994 (45th) Reunion.

I am indebted to **Marion A. Cross, Jr.** ('38) of Suffolk, Va., for sending me a feature story on **Joseph A. Stern** (Hampton, Va.) that appeared in *The Virginian-Pilot* and *The Leadstar* on December 21, 1992. **Joseph** is a fabulously successful scientist and entrepreneur who founded the Bionetics Corp. in 1969 to help NASA go to Mars. Since then his company has expanded into the fields of transportation, environmental services and more and, because of wide diversification, has weathered two recessions with solid growth in each of them. With 35 locations around the country and small operations in the Caribbean, Germany, and the South Atlantic, Bionetics has 2,600 employees and projects revenues for 1992 at \$99.1 million, an increase of 1,500 percent.

Jobs being worked on at the time of the article include 1) Providing mission support services for the Marshall Space Flight Center in Huntsville, Ala. At \$25 million a year for five years, this work is Bionetics' largest contract. 2) Caring for animals that fly in space. 3) Figuring out how space flight affects people. One experiment measures the effect of prolonged inactivity by putting subjects to bed for six weeks. (Nice work if you can get it.) 4) Retrieving samples from weather balloons. 5) Measuring how rocket launches affect the environment. 6) Making sure lead-free gas is really lead-free by checking stations around the country. 7) Studying aerial photos to find environmental damage. 8) Monitoring water quality for local governments. 9) Helping build a full-scale mockup of the future NASA space station. . . . As the article states, **Joseph** did not get where he is by taking long lunches and leaving early on Friday. So, hats off to **Joseph Stern**, another whirlwind '49er.

From **Bill Howlett** of Great Falls, Va., with whom I served on the student staff at Walker, comes an "Update for '92." "Wife **Eleanor** now bilaterally bionic—two new hips and doing well. Grandchildren number 12, with number 13 currently on the way. This has been the year of refurbishing: the house (a full rehab) and the wife. Hope you are well and happy." (Secretary's note: Having been rehabed a few times myself, I sympathize with and rejoice for the rehab done on **Eleanor**.)

Dennison L. Volkmann of Boxboro, Mass., retired from the Geodetic Survey Department of the Massachusetts Department of Public Works on June 30, 1992. Says **Dennis**: "I have been doing a little studying and playing some tennis." . . . **Harold A.B. McInnes** retired January 1, 1993, as chair and CEO of AMP, Inc., in Harrisburg, Pa. AMP manufactures electrical connectors, among other things, and in my years at Raytheon, I used to see **Harold's** connectors on military equipment all over the place.

"How much news can you stand?," inquires **Jack Fogarty**. Usually the answer would be "a lot," because I seldom have much to base this column on. His note was stapled to a thick (12-page, single-spaced) report in which he and his wife describe the September 1992 vacation trip they made to Central Europe. The material is informative, delightful, and, it turns out, very useful, because my **Neil** and I plan to make the same trip next summer. The report is so readable that I feel guilty about being

the only one who has a copy. If you want one, drop me a line.

John F. Horton writes: "For reasons unknown to me—or at least unrecognized—I decided after 43 years that it might be a good idea to drop a line to the class secretary.

"Life seems busier and better now than ever. I started a de novo bank about four years ago—mainly, I suppose, because I thought that would be something that wouldn't involve a lot of travel. The bank has been doing very well since we opened in February 1990. We're finally making good profits. And we were listed on the NBC evening news in the New York area as being the fourth safest bank in New Jersey.

"I guess I must have missed the travel because I am now in the middle of starting a yogurt production in Osowa Sien, Poland—about a four-hour drive southwest of Warsaw. Trying to negotiate with businessmen who, for two generations under the communist regime, have never had to make a business decision of significance has proved to require a lot of patience! I hope to have half of the project funded by the World Bank, which is very interested in supporting viable agricultural projects in Eastern Europe.

"We just had our tenth grandchild and, although I am sure many of my classmates have done better than that, we were pretty pleased to move into double digits."

A Christmas card from Jeannette, wife of **Archie Harris**, states that he is gravely ill in a nursing home but in good spirits. His address is 4211 W. 1st St., TRLR 79, Santa Ana, CA 92703. I am sure cards and letters would make a positive difference to Archie and Jeannette.

A letter sent recently to **Randall K. Cleworth** was returned with the information that he died April 15, 1992. The class extends its deepest condolences to Randall's family and we regret the lack of any further information.—**Fletcher Eaton**, secretary, 42 Perry Dr., Needham, MA 02192, (617) 449-1614

50

John Bickford writes from Middleton, Conn., that he has been retired since 1989 but still consults and gives seminars. He also spends time painting and sells his works in several galleries and sidewalk shows. . . . **Richard Rockstroh** and his wife, Helen, are retired but doing lots of volunteer work in their community. . . . **Kenneth Olsen** has resigned as president of Digital Equipment Corp. Congratulations from your classmates on your accomplishments over the years.

We regret to report the death of **Stephen F. Temmer** at his home in New York City. He was an audio innovator and retired executive. In his varied career, he was a technical advisor to the Watergate prosecutors on the gap in the White House tapes. He was president of Gotham Recording Co., and you may remember that he served as the musical director for station WMIT in 1946-47.

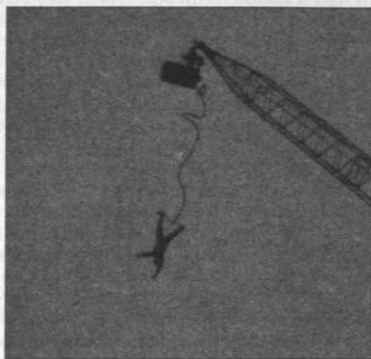
At the fall meeting of the MIT Club of Cape Cod, your class was represented by **Collie and Nat Cook**, **Frank Parisi**, and **Dot and Jack McKenna**. If any other class members are now on the Cape, we'd like to have you participate in the very pleasant and informative get-togethers.

I'm happy to be getting more class news. Keep it up. If you would like a complete copy of the poem **Sam Raymond** wrote about his bungee jumping experience (see excerpt, right), please request it from Sandra Knight at the Review office.—**Jack T. McKenna**, secretary, P. O. Box 376, Cummaquid, MA 02637

51

The National Council of Acoustical Consultants (NCAC) announces that **Bill Cavanaugh** will be the 1993 president of the Institute of Noise Control Engineering (INCE). After obtaining a degree in architecture at MIT and serving in the Army Corp

of Engineers, Bill joined the consulting staff of Bolt, Beranek, and Newman. He focused on research in building and environmental acoustics and became one of BBN's initial divisional VPs, also serving as director of BBN's Architectural Technologies Divi-



What kind of fool was I?
To jump down from the sky
I thought not of
The danger here
That golly, I might die!

As I went up the crane,
Bravado filled my brain,
I'd jump for joy,

And all my friends,
Would always praise my name. . . .

. . . Somehow I did survive
Each sequent power dive.
And staggered off
Across the park
So glad to be alive!

Now friends don't praise my name
I hang my head in shame
For when they ask,
I must reply
I could not jump again.



HUMAN YOYO TURNS POET

A bungee jump in Stockholm inspired Sam Raymond, '50, to abandon the shock cord in favor of the somewhat less life-threatening activity of poetry writing. Top: Sam descending after the first of five bounces. Bottom: Basket-case Sam snatched at the end of his final bounce.

sion. In 1970, he became an independent consultant and in 1975 formed the Cavanaugh Tocci Associates, Inc. Bill was part of the founding group of the NCAC and was its president from 1977 to 1979. He was the first recipient of the NCAC Paul Boner Medal for distinguished contributions to the acoustical consulting profession. He is a fellow of the Acoustical Society of America. Bill was an active member of our class's 40th Reunion committee.

Bill provided material on **Ranger Farrell**. Ranger has recently moved to Noank, Conn., near Groton. Prior to his retirement in 1979 because of a stroke, he headed the Ranger Farrell Associates, a thriving acoustical consulting firm. They had many prestigious clients throughout the country and particularly in New York City. His projects included I.M. Pei's John Hancock Tower in Boston. He was the inventor and developer of a sound absorbing fabric used in many domed inflatable roofed sports stadia. Recently Ranger has been an active participant in research studies at MGH's Neuropsychology Laboratory, under Nancy Hildebrandt, seeking a better understanding of aphasia in stroke victims. Ranger would welcome hearing from you. Should you be near the Connecticut shoreline, you can visit the Rangers at the Mystic River Residences, Apt. 257, 205 Elm St., Noank, CT 06340, (203) 572-8938.

We received the sad word that **Edwin Harnisch** passed away this past November. He had been an auditor for the IRS for the past 18 years. Prior to that, he had worked for the Massachusetts Electric Co. We extend our sympathies to his family. . . . Our class suffered another loss with the passing of **William Kell, Jr.** in October. We express our condolences to his wife, Elaine. . . . Our last item of sad news is of the passing of **John Napier** in February 1992. John had worked for IBM. Our sympathies are extended to his wife, Beulah.—**Martin N. Greenfield**, secretary, 25 Darrell Dr., Randolph, MA 02368

52

Last fall **Swraj Paul** was appointed to the board of governors of the new Thames Valley University, situated in west London. Congratulations, Guv'nor. . . .

Charles Saltsman retired last winter as VP of Raymond Engineering, where he has worked for 36 years. He will now devote himself to his "other business"—sculpture. . . . Last year **Phyllis and Sandy Kaplan** were in Asuncion, Paraguay, where Sandy served as a volunteer with the International Executive Service Corps. Sandy runs a construction company at home in Newton, Mass., and in Paraguay he advised a local company involved in real estate development and construction.

You may remember that **Bill Deane** was pushing for a 45th Reunion in the Far East. That proposal has spawned another for a mini-reunion that **Ray Wong** suggests take place in the fall of '94. Ray envisions a three-week tour starting from his home base in Kuala Lumpur, and going from thence to Bangkok, and then to Kunming in Yunnan, China, traveling on to Beijing, Shanghai, Guangzhou, and finally Hong Kong. Ray recently visited Kunming, "the city of eternal spring," where he served 48 years ago with the 14th Air Force during World War II. He likes Kunming because of its scenic beauty and because it is off the usual tourist track.

If there is sufficient interest, this mini-reunion cum expedition will happen. Classmates who want to participate will please contact Class President **Bob Lurie**, Reunion Chair **Stan Sydney**, **Dick Heitman**, or myself and let us know. If you have suggestions of your own, they will be entertained, too. Note that I have cagily omitted everyone's address except my own. Send along news about yourself when you write.

I am very sorry to announce the deaths of two classmates: **Henry Cross** of Needham, Mass., who died June 30, 1990; and **Philip Hallof** of Don Mills, Ontario, who died September 21, 1992. I have no information on the lives or careers of either.—**Richard F. Lacey**, secretary, 2340 Cowper St., Palo Alto, CA 94301, e-mail: lacey@hpl.hp.com

Please send news for this column to: **Gilbert D. Gardner**, secretary, 1200 Trinity Dr., Alexandria, VA 22314, (703) 461-0331

Dean Jacoby breezed through Connecticut last October and stopped by the University of Bridgeport to see if it really exists. After a pleasant chat in my office, we had lunch at the local club and continued discussing world and Class events. Dean promised to send me a few items for the column, which arrived just after I wrote the notes for the last issue. . . . Dean tells us that **Sally and Ron McKay** are living in Woodland Hills, Calif. Ron founded an acoustic consulting firm, McKay, Conant, Brook, Inc., some four years ago and is doing well. . . . **Georgann and George Filak** are living in Dallas, where George is working with a realtor after retiring from Texas Instruments a year ago. . . . **Chuck Masison**, according to Dean, retired from GTE a few years ago and is now very active running a Taylor Rental franchise. . . . **Dick Wallace** retired from Sperry about a year ago, and he and Charlee are struggling with retirement in New Mexico. . . . And **Wally Boquist** continues to head Technology International Corp., which he founded. . . . Dean himself is busy running his investment firm, Chrysalis, in Cambridge, Mass. He and Judith are both well.

Mike O'Neill has written from Shoreham, Vt., where he is surrounded by dairy farms and apple orchards. He took early retirement from Perkin Elmer a year ago. Mike continues to consult for Perkin Elmer and others on occasion, but is really interested in restoring the old buildings on his new property in preparation, he says, for raising livestock. During his 36 years at Perkin Elmer, he was mostly involved with instrumentation, specializing in thermal analysis. He acquired some 14 patents and published quite a few papers in journals.

Cathy and George Schwenk's cat, Crathern, sent us the usual letter with their Christmas card. The cat tends to carry on more about itself than its principals, but did supply some information. George is still trying to rescue new businesses and new ideas through the Breakfast Club described here some time ago. He is still active with the Boy Scouts, and he and Cathy still travel—Florida, Alabama, and Virginia were on their itinerary last year. Cathy continues to run her school district and town meetings. And last November she got a certificate in gardening arts from the Arnold Arboretum. George and Cathy live in Mason, N.H.

Sam Armour sends word from Shelley, Idaho, that he is completing his career with the U.S. Department of Energy, where he has toiled as an R&D program engineer in nuclear engineering. . . . Please let us hear from you when you have a chance to write.—**Edwin G. Eigel, Jr.**, secretary, 33 Pepperbush Lane, Fairfield, CT 06430, fax: (203) 576-4983

A most welcome note from **Dennis Shapiro**, Course VI, on the occasion of your co-secretary's move to Bethesda, Md, last year, offering some advice on my consulting work with the U.S. Postal Service (funny how everybody seems to be an expert at that). Dennis continues as chairman of Lifeline Systems, Inc., but is also now working with the Massachusetts Department of Education on Project PALMS, an NSF-funded initiative to effect statewide systemic changes on how math and sciences are taught, K-12. The "P" stands for Partnerships, and Dennis' committee deals with the role of businesses and institutions in providing people, facilities, equipment, and other support to their local schools. Meanwhile, wife Susan is a partner at Ropes & Gray, practicing law in the area of estates and trusts. They continue to ice

dance regularly at the Skating Club of Boston and have built a summer home on Nantucket, where they race their Marshall 18-foot catboat with the local fleet. Dennis has kept active as a pilot, which solves their transportation problems nicely. Daughter Alison (26) is studying Talmud in Jerusalem, Rachel (24) is in television production in New York City (recently worked on an ABC network special on AIDS), and son Zach (22), who graduated from Colby last June, is enrolled in the Rabbinical Program at Hebrew Union College in Cincinnati and doing his first year in Jerusalem.

Peter Heller, Course VII, has been developing new teaching materials for basic physics, involving hardware and real experiments. These are for use at levels ranging from high school to graduate school. This work has led to numerous invitations to serve as an educational consultant for regional, national and international groups. Peter's efforts were also recognized last year through the award of the Louis Dembitz Brandeis University Teaching Prize. . . . **Stephen Loring**, Course XV, is enjoying making handcrafted furniture at Dovetail Wood Works with his son and daughter-in-law. They started the company in Worcester about four years ago and report that it is going very well. . . . **David Kramer**, Course III, has been working at Rocketdyne in Canoga Park, Calif., on a part-time basis since his retirement in 1989. Currently, he is doing some materials engineering for the Space Station. At home, he tends his collection of music (1900-1950), paints, reads, and watches the surf.

William Sweeney, Jr., Course XV, is continuing his work as a management consultant, based in Concord, Mass., specializing in program and project management. His major client at present is a Massachusetts-based computer manufacturer (not too many of them left!) now building a half-billion dollar fabrication facility for computer chips (that should narrow it down pretty well). . . . **Wayne McClung** writes: "68 and still going. Added a new great-grandson, Chad, on June 20, 1992."

Charles W. Johnson, who received a BE in civil engineering from MIT in 1955 after having earned a BS from the University of Wisconsin in 1952, recently established, with his wife Jennifer, a professorship in the Department of Electrical Engineering and Computer Science. Charles is the founder and chairman of IMSL, Inc. of Houston. IMSL designs, markets, and supports general-purpose FORTRAN software systems for scientific and engineering applications on a wide range of computing platforms. Charles founded the company in 1970 after 15 years with IBM, and Jennifer has been a company officer since 1971. In addition to the establishment of the Charles W. and Jennifer C. Johnson Professorship in Computer Science, the Johnsons also support the Johnson Prize, given annually to an MIT undergraduate for outstanding performance on a thesis in computer science.

On a less happy note, **Harlan Walker**, Course X, writes that he is suffering from damage to his liver, pancreas, testes, and heart, together with chronic fatigue syndrome, diabetes, and high blood pressure—all caused by what he describes as incompetently undiagnosed hemochromatosis. To compound his problems, his wife, Gail, was laid off after more than 13 years at Exxon and has not yet found a replacement job. Our heartfelt best wishes to Harlan.

Doing these notes is a pleasure with so many news bits coming in, often accompanying contributions. Keep 'em coming!—Co-secretaries: **Roy M. Salzman**, 4715 Franklin St., Bethesda, MD 20814; **James H. Eacker**, 3619 Folly Quarter Rd., Ellicott City, MD 21042

"The life of a start-up company president is exciting to say the least" according to **William Peter, Jr.**, president of Data Medical Clinical Support Services, Inc., in Minneapolis, Minn. Bill formed the software medical company and acquired two established companies to develop medical software and related database systems for hospitals, home

care, and nursing homes. Bill retired from Du Pont about eight years ago and has been enjoying his new challenge since. . . . **Peter Calcaterra** has been promoted to project manager, planning and development in the newly created Planning and Budget Directorate of the Massachusetts Bay Transportation Authority (MBTA). Daughter Janet Kathleen was 4 in September, granddaughter Lillian Joy will be 2 in February, and grandson John Peter was born on Veterans Day. . . . **Ellen Harland**, after practicing architecture for 33 years in the private sector, in 1988 joined the federal government as an architect in the Civil Rights Division of the Department of Justice. One of Ellen's primary duties is to provide information and technical assistance to organizations and individuals regarding their rights and responsibilities under the Americans with Disabilities Act.

Kreon L. Cyros is responsible at MIT for the Office of Facilities Management Systems work in developing integrated database and CAD systems to help manage MIT's facilities as well as other schools' facilities across the U.S., Dublin, and soon Tokyo. Kreon has two sons and a daughter. . . . **Richard B. Kelly** has been promoted from VP to Executive VP of Stone & Webster Engineering Corp. . . . **Rusty Schweickart** is president of Courier Satellite Services, Inc. in Tiburon, Calif. The company is involved in building a communication satellite system keyed in on the developing nations. Rusty and his wife, Nancy, have seven children. They have traveled extensively. . . . **Ilse Armour** is working as a mathematics instructor for pre-college students in Shelley, Idaho.

Stanley Hart, a senior scientist at the Woods Hole Oceanographic Institution, Woods Hole, Mass., was honored by the Geochemical Society as recipient of the Goldschmidt Award. Stanley, an isotope geochemist in the Institution's Geology and Geophysics Department and a former MIT faculty member, was cited for his "distinguished contributions to geochemistry. His recent research activities have focused on the origin of hot spots and mantle plums and the dynamics and evolutions of the deep earth. Stanley received an SB and PhD from MIT and an MS from Caltech. He served as a professor in the Department of Earth, Atmospheric, and Planetary Sciences at MIT from 1975 to 1989, and has been a visiting professor at MIT since joining the WHOI staff in 1989.

Irwin Dorros was honored last December 10 at the newly opened Liberty Science Center by the Research and Development Council of New Jersey as the recipient of its top award, the Science/Technology Medal, for his outstanding management leadership that has brought "innovation to the marketplace." He is the executive VP of Livingston-based Bellcore, the research arm of the Bell operating companies created in the 1984 court-ordered divestiture of AT&T. He leads an organization of 5,500 scientists, engineers, and software specialists who provide major technical support to seven companies with network investments of \$20 billion each. Dorros gave the U.S. keynote address to the International Switching Symposium (ISS '92) in Yokohama, Japan, to 2,100 delegates. Extensive business travel has taken Dorros to Europe and Japan as well as the U.S. Irwin and his wife, Janet, enjoy golf and gardening as well as photography and stamp collecting. They have three children—Mark, an engineer; Gail, a product manager; and Gerald, an investment banker working in mergers and acquisitions.

I regret to report that **Morrin E. Hazel, Jr.** of Saugus, Mass., passed away September 14, 1992. Morrin was a transportation engineer with the federal Department of Transportation. He was the husband of Reverend Elizabeth Hazel of the First Congregational Church in Saugus Center, Mass. He was a member of the Appalachian Mt. Club, former treasurer of Campground Committee (AMC), former treasurer of East Coast Amateur Television, a member of Slightly Mad User of Digital Group Equipment (SMUDGE), chairman of the Finance Committee of the Harvard-Epworth United Methodist Church in Cambridge. He was an Army veteran and belonged to ROTC. He leaves his wife,

a son, three daughters, a brother, and a grandson.
Send news to **Ralph A. Kohl**, Co-secretary, 54
Bound Brook Rd., Newton, MA 02161

57

Jim Simmonds, who is a professor at the University of Virginia, Charlottesville, has been named a fellow of the American Society of Mechanical Engineers. Jim teaches engineering and applied science at Virginia and also chairs the Department of Applied Mathematics. . . . **Alex Bernhard** has been appointed to the Advisory Board of the American Repertory Theatre (A.R.T.) and Institute for Advanced Theatre Training at Harvard University. The A.R.T. is a major professional repertory company funded by Harvard University and various other private and government sources. Alex is a corporate lawyer and a partner in the Boston law firm of Hale and Dorr.

Daniel Borenstein writes that he went from MIT into the army and thence to medical school. He has been practicing psychiatry and psychoanalysis for 26 years in West Los Angeles. He now serves on the California Medical Association Board of Trustees and on the Board of Trustees of the American Psychiatric Association, where he represents all of the psychiatrists in California. He and his wife, Bonnie, recently celebrated their 25th wedding anniversary. They have one son, 21, doing graduate work at Stanford. . . . **Kendall North** was honored at the Lynchburg College Alumni Association awards banquet, where he received the Honorary Alumni Award, which honors non-graduates for exceptional interest, dedication, and service to the college. He has been a professor in the School of business for the past 21 years. He established the English Proficiency Committee in 1976 to promote reading, writing, and reasoning proficiency throughout the curriculum and was also instrumental in establishing a Senior Symposium as a degree requirement for all undergraduates.

David Hoult has been appointed co-director of the new MIT Manufacturing Institute. This is an academic/industrial corporation designed to facilitate the development of manufacturing research into real manufacturing practice. It will serve as a research development, and teaching organization for engineering students. Initial funding is from the National Science Foundation, and additional industrial partners are being recruited. David taught in the mechanical engineering department from 1967 to 1975, when he left to form a consulting company. . . . **Ed Friedman**, professor of management and director of the Center for Improved Engineering and Science Education at Stevens Institute of Technology, received the New Jersey Governor's Pride Award for education. He was specifically recognized for developing a national model for improving mathematics instruction by teaching middle and high school teachers how to integrate computers into their classrooms.

A. Dickson Hause passed away in September 1992. He had been a member of the technical staff of the research division at Bell Laboratories. He coauthored the operating system for one of the first multi-user, timesharing computing systems, developed an interactive graphics system for time-shared computers, and designed the call-processing software for an experimental local digital telephone switch. He is survived by two sons, a daughter, and a brother.—**John T. Christian**, secretary, 23 Fredana Rd., Waban, MA 02168

58

35th Reunion

Happy New 35th Reunion Year! It's less than two months away, so send in your registration soon for the reunion weekend at the Black Point Inn out on Prouts Neck near Portland, Maine. By now, you've received several mailings and you can see that the committee has planned an "awesome" choice of activities for everyone.

In fact, why not make it a vacation week, as Linda and **Ken Auer** are doing. Ken writes, "We have not been back to New England since 1987, which was our first year in Cincinnati. We plan to visit my old homestead early in the week prior to the reunion and then spend the following week surprising friends all over New England!"

Mal Johnson remarks, tongue in cheek, "We've enjoyed the reunions at Martha's Vineyard but, as an alternative, let me suggest downtown Toledo in February!" (Sounds like he's in dire need of a vacation.) . . . **Art Zimmet** says, "I'm planning to attend the reunion and looking forward to seeing classmates." . . . **Martin Victor** sends word: "I've retired from the Air Force effective February 1993. We attended the 30th and are hoping to make the 35th."

Quite a number of early retirements and second careers to report this month. **Robert Crice** retired from AT&T and reports: "Anna and I have moved back to our roots in western Kentucky. Exciting things are happening here as economic growth is outpacing the general economy. We're enjoying our retirement fully." . . . In December, **John Forrest** retired from the U.S. Air Force with the rank of colonel. He was at Luke AFB and continues to live in Phoenix. . . . **Al Gough** recently retired as president, Manville Specialty Products Group in Littleton, Colo. He notes, "After a year of worldwide traveling, I've taken a 'retirement job' as president of the Lighting Research Institute (LRI). I'd be interested in hearing from others active or interested in lighting research."

Hans Morgenstern continues his consulting activities in environmental, chemical, materials, and safety engineering. Based in the Baltimore area, Hans is actively seeking additional clients and projects. . . . **Richard Klafter** was named president of the IEEE Robotics and Automation Society. . . . At Brown University, **Paul Knopf** was selected as the first Charles and Helen Stuart Professor of Medical Science. . . . We learned belatedly that **Ramon Suehrstedt**, a project engineer with Fluor Corp., had died in May, and we extend our sympathy to his wife, Eleanor. . . . **Hans Fritschi** advises: "Now working at Biogen in Cambridge as a computer systems engineer, configuring and installing process control software for a new biotech production plant. Lots of challenges, lots of fun!"

Be sure to return the class questionnaire—we've been polling since our 5th Reunion, so it's fun to see the changes that have occurred over the years. Also, if you have not done it already, please send your class dues of \$19.58 to help defray mailing costs and other expenses the class incurs every five years. See you at the reunion!—**Mike Brose**, secretary, 75 Swarthmore St., Hamden, CT 06517

59

Marty Zimmerman reports from Chicago, where he runs four companies in the health care field as well as continuing in the medical equipment leasing and used scanner business (The LINC Group, Inc.). His report updates us on **Jaime Glottman's** move from Bogota, Columbia to Tel Aviv, Israel, and on **Victor Mashaal** and his wife, Edna, who, along with running a company, also organizes a New Year's party in Fort Lauderdale for a few hundred close friends and family from all over the world!

Jack Fisher convened a convivial and well attended meeting of the 35th Reunion Committee at the Faculty Club, and it appears we have some excellent choices for the reunion. More to come!

Speaking of reunions, let me offer my personal testimonial to their effectiveness in rekindling old friendships. At the last one, Ginny and I became reacquainted with **Larry Boyd** and spouse Bette who live in Portland, Ore. Since that time we have enjoyed three fantastic sailing expeditions with them, chartering for a week in the San Juan Islands north of Seattle (where Captain Boyd and First Officer Packer only hit one rock), Chesapeake Bay (where the same crew ran around a few times), and the British Virgin Islands, which as of this writing is yet to come. Larry also took his three sons

and our youngest on a mega-trip this summer, circumnavigating Vancouver Island. Quite an accomplishment and adventure for all.

Sylvester Miniter has returned to South Carolina from four years in Paris with IBM, and is embarking on new career directions after 27 years in R&D with IBM. Sadly, he reports that he and his spouse, Gabriele, left IBM after their 24-year-old son was murdered in a "car-jacking" attempt in West Palm Beach, Fla., in April 1992.

Fred Wan, professor of mathematics and associate dean at the University of Washington (Seattle) will be on leave to serve as the director of the Division of Mathematical Sciences at the National Science Foundation for two years starting January 1993.

Bill Poduska's appointment to the Board of Cambridge Technology Partners in Cambridge, Mass., was reported in September. More kudos, Bill.

And finally, I've had the pleasure of seeing **Mike Nash** several times recently. He is a managing director of Biach Industries in Cranford, N.J. In this role he has been exploring systems thinking and simulation and working with a consulting firm in Cambridge. That's it for now.

We are committed to a continuing flow of Notes in editions to come, and I actively solicit your news and your views. I know from the comments received that your items and updates will be greatly appreciated by your classmates and friends!—**Dave Packer**, 31 The Great Road, Bedford, MA 01730, (617)-275-4056

60

While I hope, dear readers, that you are reading these notes in the beautiful springtime sunshine, it is a dreary December 30 in the Big Apple as I type. Although Marie says "no way," I'm hoping to stroll down to Times Square tomorrow night to see the ball drop in person. Although I've spent many Christmases and a few New Years in New York, I've yet to brave the Times Square throng. Maybe this will be the year.

A few weeks ago, I had a pleasant surprise when **Bob (Rusty) Troth** paid me a visit. After 32 years, Rusty has finally retired from active military service, and he and Betty have settled in Huntsville, Ala., the location of his last Army assignment. Rusty is in business for himself, consulting for the Army—and, I'm sure, others seeking his expertise. Good luck in your new endeavors, Rusty.

From Medford, N.J., **Donald Sipos** writes that he has five grandsons, all living in Houston, Tex., the home of his two children. Don said that a recent visit to Saint Petersburg and Moscow, during a Christian humanitarian and mission trip was "quite an eye opener." . . . **Robert Hodges** writes that he is still active in competitive senior tennis (and still winning, I'm certain, as in his Tech days). Bob is still in Phoenix, Ariz., with the Rogers Corp., where he is responsible for all their electrical laminates business. . . . **Lawrence Kravitz** reports that he continues his work at Aberdeen, Md., evaluating an airborne assault gun for the Army. His daughter, Clara, is a junior at University of Delaware pursuing a degree in physical therapy. Daughter Jennifer is a high school senior hoping to begin a medical career as a Brandeis undergraduate.

A note from **Charles McCallum** states that he has been named chairperson of the Michigan Export Council, one of 50 such councils appointed by the Secretary of Commerce in support of U.S. trade objectives.—**Frank A. Tapparo**, class agent and secretary, 15 South Montague St., Arlington, VA 22204

61

April Fool's Day reminds me of the time the Texas Legislature voted to honor Albert Desalvo (the Boston Strangler) for his efforts in population control. They had never heard of Albert but favored population control. Every year I propose to write a



PIONEER IN "SQUEEZED LIGHT" HONORED

Last fall in Czechoslovakia, Melvin Teich, '61 (left), received the Memorial Gold Medal of Palacky University from Josef Jarab, rector of the university. Teich, professor of electrical engineering and applied physics at Columbia, is widely known for producing a form of light with reduced noisiness, called squeezed light.

totally fake column describing the miseries of our classmates but never have the guts. So, despite my worst leanings, everything that follows is true (no promises for next April).

Malvin Teich, who works for Columbia University as a professor in electrical engineering and applied physics was over in Czechoslovakia last fall. While there, he picked up a Memorial Gold Medal at Palacky University. It recognized his contributions to the understanding of light's fundamental processes. Congratulations. . . **Bob Pease** also got an award last year. His was a certificate of merit from the American Business Press. It was because of Bob's well known (in the trade) "Pease Porridge" column.

That's it for now. I get notices of people moving from one address to another. This usually means something important. Let me know what it is.—**Andrew Braun**, secretary, 464 Heath St., Chestnut Hill, MA 02167

62

Barrett "Barry" Roach has been appointed executive VP for strategic development at Fair Isaac & Co. in San Rafael, Calif. Barry was formerly VP of finance and CFO for Elexis Corp. in Miami, Fla. We hope the California sun shines as brightly for Barry as did the golden orb in Florida. . . . According to the *Wall Street Journal*, **Steven D. Levy** has resigned as president of FCA International, Ltd., Westmount, Quebec. The *WSJ* did not mention what Steve will be doing next, but we wish him good fortune in his next business venture. . . . **Steven J. Brams** writes that he is continuing the adventure as professor of politics at NYU. In 1992, Steve was elected a fellow of the AAAS, one of four so honored in the "social, economic, and political sciences." The times really are changing when the "hard" sciences recognize significant accomplishments in the "social" sciences.

Albert Blackwell, Reuben B. Pitts Professor of Religion at Furman University, has published a translation of Friedrich Schleiermacher's treatise *On Freedom*. The book, containing a 50-page intro-

duction by Blackwell, was published by Edwin Mellen Press in Lewiston, N.Y. Schleiermacher was a prominent German theologian and philosopher who died in 1834. Blackwell, who received an SB in physics from MIT and a PhD in Christian theology from Harvard University, has been a member of the religion faculty at Furman since 1971. Long known for his interest in peace and justice education, he is the founding chairman of The Piedmont Peace Resource Center. We never ceased to be amazed at the variety of accomplishments of our classmates, but I find it particularly interesting that physics provides a path to higher forms of human understanding.

We are saddened to report the death of **Charles A. Martin** on November 5, 1992. Charles lived at 21 Penny Lane in Milford, Mass., and was an electrical engineer at Raytheon Corp. in Sudbury, for 30 years. He leaves his wife, Kathleen, a son, a daughter, three brothers, three sisters, and a number of nieces and nephews. He was born in Madison, Kans. Memorials may be

made to ALS Research, c/o Muscular Dystrophy Association, 33 Lyman St., Westboro, MA 01581.

Dwight A. Kellog, VP and CFO of Telesector Resources Group, Inc., a subsidiary of the NYNEX Corp., retired as of March 1, 1993, to start a telecommunications trade publication. Dwight has worked in the telecommunications industry for 30 years and once served as comptroller of New York Telephone. He "presided over an aggressive upgrading of financial information systems, as well as the implementation of performance measurements to track more effectively the Telecommunications Group's progress in controlling costs and generating new revenues. Kellog also developed new incentive-based compensation systems for NYNEX's telecommunications executives." Dwight figured importantly in the reorganization of NYNEX upon the breakup of the Bell System in the mid-1980s.

Oliver R. Smoot, Jr., was featured in a *Boston Globe* article October 20, 1992, commemorating the 34th anniversary of the 1958 "Smooting" of the John Harvard Bridge on Mass. Ave. Few graduates of MIT have achieved international fame as a standard of measurement, but Ollie Smoot is credited with that historical distinction. It is also somehow appropriate that Ollie, executive VP and treasurer of the Computer and Business Equipment Manufacturer's Association in Washington, D.C., has an official capacity with the National Institute of Standards and Technologies. The MIT Museum has "364.4 Smoots + 1 Ear" T-Shirts, for those of our classmates that would like to celebrate Ollie's fame and one of the most famous and enduring events of MIT folklore. You will recall that our class provided the bronze plaque for the bridge as part of our 25th reunion in 1987. I thought that Ollie's remarks were quite appropriate when he summed up all of "Smootistory" with the following comment: "It's like a parable that this caught on...what the lesson is, however, I don't know."

Join your classmates on MIT1962: If you have an e-mail capability that will connect with Internet and haven't done so, please subscribe to MIT1962, now operating through the courtesy of MIT Computer Systems. You may join the network by sending the message text: SUB MIT1962 to LIST-

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63

30th Reunion

This is one of my last columns (more about that later), and I have a raft of news to report. **Tony Geisler** sends a letter for the first time in years. He and his wife, Dee, recently moved to Diablo, Calif., near San Francisco. He sells raw food to food processors, stuff like tomato paste, lecithin, and oat bran. Dee is an elementary school resource specialist in San Ramon. Rebecca, 21, will graduate in political science this June and is thinking of law school, while Wendy is a sophomore biology major thinking of medical school. Both daughters are at the 'Tute. Tony and Dee are looking forward to our 30th Reunion and to meeting any classmates who live or wander into the Bay Area. . . . **Joel Schindall** lives in San Diego with his wife, Alice, and daughters Katie, 10, and Julie, 7. He looks forward to the 30th Reunion, his first! . . . **Carl Dover** is adjunct professor of physics at Yale and a managing scientist at Brookhaven Lab. . . . **Jim Fidelhotz** lives in Puebla (city), Puebla (state), Mexico, where he is a national researcher in linguistics (Spanish, English, Totonaco, and Micmac) and professor at Autonomous University of Puebla.

From **Meg Hickey** comes word that she recently exhibited a 100-foot "printout of the logistic equation substituting colors for numbers in the form of two take-offs on Trojan's Column and the Tower of Babel at the Do-while gallery in Boston." Right. Now, Meg, can we get a little more background? . . . **Bob Campbell** has been elected to the board of Cigna Corp., and continues as chair, president, and CEO of Sun Co. of Philadelphia.

Bill Vachon lives in Manchester, Mass., where he has a consulting practice in wind energy mechanical issues. . . . From **Ron Walter** I hear that his daughter Amy just started at Penn, while Alison began kindergarten. His wife, Marion, is a professor at Brooklyn Law School, and he is still at Citibank. . . . **Bob Turtz** is a partner in a law firm in Roseland, N.J., while his wife, Susan, is an administrator at United Jewish Appeal.

Ron Rueckwald has a son graduating from the 'Tute this June, while Ron looks forward to the reunion.

From Lewisville, Tex., comes a note from **Phil Graham**, who has managed two of his own companies, but is now with Xerox. . . . **Patrick and Elizabeth O'Neil** live in Lexington, Mass., teach mathematics and computer science at UMass, and do consulting in database software. . . . **John Graham** remains medical chief in a mental health center at Daly City, Calif., and has a small psychiatry practice. His son Michael is graduating from Brown, and Peter is a high school sophomore.

Vic Evans is president of advanced technology at Hoechst Celanese Corp., and lives in Short Hills, N.J. . . . **Ruth Nelson** lives in Watertown, Mass., and has discovered Tai Chi and Buddhist meditation. She works in computer and network security at GTE. (Isn't it wonderful what a range of vocations and diversion we all pursue?) She has a daughter in grad school in Edinburgh and a son who is a senior at UMass/Amherst. . . . **Paul Richman** is chair of Standard Microsystems, a major player in LAN products on Long Island, N.Y. . . . **Richard Merrill**, Course II, says, "Now I know what it's like to be unemployed!" Folks, can anyone

The MIT-James Joyce Connection

For 60 years, scholars puzzled over the identity of "Vladimir Dixon," the mysterious author of a letter to James Joyce commenting on an early installment of *Finnegans Wake*. The letter is a small masterpiece of respectful mockery, capturing the punning, scatological, and comic energy of Joyce's original so perfectly that it was believed to be the work of Joyce himself.

The letter was included in the first book of criticism ever published on Joyce—sharing space with the work of such eminent writers as Samuel Beckett and William Carlos Williams—but not until the appearance of the spring 1992 edition of the *James Joyce Quarterly* did the surprising truth come out: Vladimir Dixon was a 1921 MIT graduate in mechanical engineering, a businessman and devotee of the avant-garde.

Vladimir was born in Russia in 1900. His father, Walter Dixon, an English engineer who adopted American citizenship, was an expert in locomotive design who went to Russia to work on the construction of a locomotive factory. He married Ludmilla Bidzhevskaya in 1898, and in the year of his son's birth was hired by the Singer Corp. to organize its extensive manufacturing operations in Russia.

The younger Dixon came to MIT from Russia as a sophomore in 1917, spent a year as a translator in the U.S. Army in 1918–19, and graduated with a degree in mechanical engineering in 1921. In the following year he earned a master's degree from Harvard and accepted a job with Singer. In part because of his cosmopolitan background and his mastery of languages, Dixon was dispatched to Paris in 1923 as a company auditor. His work required extensive European travel and allowed him to pursue his burgeoning interests in avant-garde literature, music, and art.

Fluent in French and German as well as English and Russian, Dixon was an ideal reader of Joyce's last and most difficult book, *Finnegans Wake*, a vast compendium



Though he died tragically young, Vladimir Dixon, '21, left a rich cache of memorabilia, including his annotated copies of the journal transition, in which early installments of Finnegan's Wake were first published. The photos show his study on the Avenue Junot near Sacre Coeur Cathedral, a stop at Paris' famous cafe Les Deux Magots, and writing (accompanied by Teddy bear) while on holiday in St. Tropez.

of European history and myth written in a punning, multi-lingual style. The book has amused, frustrated, and baffled readers ever since its first installments began to appear in Parisian magazines in the 1920s under the title "Work in Progress." Copies of the journal *transition* containing some of these early installments, heavily and learnedly annotated in Dixon's elegant hand, survive in the library inherited by his son John.

Joyce worked for 14 years on *Wake* and encouraged his large coterie of admirers (Beckett chief among them) to publish an anthology of worshipful articles about his "Work in Progress." Published in 1929, fully a decade before the novel was completed, this book carried the unwieldy and uninterpretable Joycean title, *Our Exagmination Round his Factification for Incamination of Work In Progress*.

The extravagant delight in language itself, in the suggestive power even of syllables, in the profusion and confusion of sound and sense carried by puns and portmanteau words evident in that title hints at the peculiar pleasures and frustrations of *Finnegans Wake* itself.

Dixon's contribution to *Our Exagmination* is the book's final entry, one of two "letters of protest" that Joyce himself arranged to add to the volume as a kind of postscript. "Dear Mister Germ's Choice," Dixon begins, "in gutter dispear I am taking my pen toilet you know that, being Leyde up in bad with the prewailent distemper (I opened the window and in flew Enza), I have been reeding one half ter one other the numboards of "transition" in witch are printed the severall instorments of your "Work in Progress."

As the proliferating puns in this first sentence suggest, Joyce was obsessed by the ways in which words, especially as they sound, carry inherent ambiguities and generate associations that undermine linear sense and logical progression. Dixon's understanding of these central qual-



In 1925, Dixon married Juanita Agner, a tourist from Kansas whom he met in Paris. They and their infant son John lived in France, where Vladimir worked for Singer until his death in 1929.

ities in Joyce is remarkably keen, but his own power to imitate, recreate—and perhaps even to judge—they are more impressive still.

"You must not stink," Dixon continues, "I am attempting to ridicul (de sac!) you or to be smart," though he is, of course, doing both, "but I am so disturd by my inhumility to onthorstand most of the impslocations constrained in your work that . . . I am writing you, dear mysterre Shame's Voice, to let you no how bed I feeloxerab out it all."

Dixon's emphasis on the scatological—as in gutter, toilet, stink, dis-turd—exactly catches a key tendency in the original and perhaps carries a note of complaint to which Joyce himself, along with his commentators, was oblivious. I realize, Dixon observes in his next paragraph, "that the labour involved in the composition of your work must be almost supper humane and that so much travail from a man of your intellacked must ryeseult in somethink very signicophant." Intellect, or its lack? Some may think such work important, but are these admirers merely *sycophants*?

Is it my illness, Dixon asks, that makes me "unable to combprehen that which is clear or is there really in your work some ass pecked which is Uncle Lear?" In more mannerly but less Joycean form, that riddling question—which murmurs of obscurity, vulgarity, and irrelevant or promiscuous allusiveness—still haunts *Finnegans Wake* and all its readers.

Why was Dixon not recognized as the author of this remarkable document? The full answer is complex and poignant.

First, Dixon's mastery of Joyce's style seems unlikely in the businessman whose senior thesis at MIT was entitled "The Thermodynamic Properties of Ethyl Chloride." Second, because Dixon himself died of complications following an appendectomy only seven months after the publication of

Our Exagmination, he was not alive to defend his authorship when the claim that Joyce had

invented him was first made. Third, influential members of Joyce's circle, including his patron and publisher Sylvia Beach, encouraged the notion that Dixon was a fictional character. Joyce was known to have played a significant role in the publication of *Our Exagmination*. Some of its essayists openly acknowledged that Joyce had corrected their contributions, and the very title was known to have been Joyce's own. So there was small reason to dissent when Richard Ellmann's definitive biography of Joyce stated unequivocally: "Vladimir Dixon was Joyce himself."

The indisputable evidence of Dixon's existence, as well as his authorship of the final entry in *Our Exagmination*, is available in vol. 29, no. 3 of the *James Joyce Quarterly*. This issue includes a series of lovely, haunting photographs of Dixon and his young family in France of the 1920s; a biographical sketch; a memoir by his son; an edition of Dixon's correspondence with Ezra Pound on matters poetic and musical; and a listing of Dixon's own publications. It turns out that this hitherto invisible engineer was himself the author of three books, one published posthumously, all in Russian, containing poetry, stories, and prose sketches.

Translations of a selection of his poetry—deeply religious lyrics in a straightforward style utterly unlike the punning, vulgar extravagance of his Joycean parody—are also included in the issue. They serve, appropriately, to conclude but also to deepen the Vladimir Dixon mystery. □

—David Thorburn (*The author is professor of literature and director of the Cultural Studies Project at MIT. He has published widely on modern writers, including Joyce, and has taught Joyce in the classroom for 25 years.*)

help here?

Sad news from Morrisville, Pa., where **William Goldberg** died on October 12, 1992. I am sorry I have no more details and would like to hear from anyone who does so I can pass them on. Our condolences to his family.

This is an early warning: 10 years is long enough for one person to hold any office. At the 30th Reunion I will give up the post of secretary. I hope I have in some small way followed the precedent set by **Mike Bertin** before me and invite anyone who is interested to attend the reunion and place his or her hat in the ring (or let me know you are interested). It's a fun job but high profile. Meanwhile, keep them cards and letters coming.—**Phil Marcus**, secretary, 3410 Orange Grove Ct., Ellicott City, MD 21043, (410)-750-0184, CompuServe: 72047.333—Internet: 72047.333@compuserve.com.

64

My calendar says mid-December and happily the end of the year donation cycle is upon us. Much of what follows comes from notes that accompanied Alumni/ae Fund contributions. **Mike Auerbach** reported his recent promotion to senior associate director of safety and regulatory affairs at Pfizer Central Research in Groton, Conn. He is responsible for new food ingredient and chemical product registrations and approvals in Japan, Canada, Australia, New Zealand, Latin America, and Southeast Asia. Sounds like a position that involves just a bit of travel. Mike's son, Dave (MIT '71), is now a chemistry graduate student at UC-Berkeley.

Richard McEntire is working with the *Galileo* and *Epic* spacecraft. Epic is a Japanese spacecraft launched in July 1992. It is in orbit around the earth investigating the "tail" of the earth's magnetosphere. . . . **Bob Mehrabian** has apparently settled well into the Pittsburgh community in his relatively new position as president of Carnegie-Mellon. He was recently elected to membership on the board of directors of PPG Industries Inc. . . . **Michael Hale** describes himself as having "survived" the merger of Bank of America and Security Pacific Bank. He has been appointed VP and manager of financial applications for Bank of America/Oregon. He is among those involved in reconstituting the MIT Club of Oregon and asks that any interested alums in Oregon or southwest Washington contact him at (503) 275-1434.

The last item comes from the Institute's newscipping service which spotted a column in the *Rockland (Maine) Courier-Gazette* about Rockland native **Don Reed**. A course XII major, Don has been living in Norwell, Mass., for the last 30 years. He has been serving as a water commissioner for the last several years, and recently, a town official estimated that Don has contributed about \$50,000 worth of professional services to the town. Don's career as a geologist includes being part of the team that surveyed northern parts of Alaska—leading to the discovery of the Prudhoe Bay oil fields. He has been involved in route selection for a transatlantic phone cable, in the construction of a major telescope on Mount Hopkins in Arizona, and in geologic explorations for many Boston office buildings.

Think Reunion! It's just a little more than a year till our 30th!—**Joe Kasper**, secretary, RR 2, Box 4, Norwich, VT 05055

65

Harry Binswanger and I finally connected after many years. Harry, **Dave Trevvett**, **Phil Strause**, and I had all attended Thomas Jefferson High School in Richmond, Va., together. Harry graduated in humanities and engineering and went on to get his doctorate from Columbia in 1973. Harry's career has been focused on the objectivist phi-



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losophy of Ayn Rand, and he is currently director of the Ayn Rand Institute's graduate philosophy program and a member of its board of directors. Harry lectures regularly to campus objectivist groups and recently lectured at Boston University. He says that this seems to be one of the only intellectual movements that excites students. During the '80s he wrote and published *The Objectivist Forum* and edited the *Ayn Rand Lexicon*.

Harry gave me the excuse to call **Kim Kimmerling** and get updated on his activities. Harry and Kim had been close friends at MIT, and Kim, it turned out, had tried to attend Harry's BU lecture recently. Kim moved to MIT two years ago after 20 years at Bell Labs to accept the Thomas Lord Professorship of Materials Science and Engineering and develop a program focused on electronic materials. He has become active in MIT's Leaders for Manufacturing program as well. His children are grown and he and his wife recently located in Concord ("as long as we were going out there for walks and fresh vegetables, we thought we might just as well live there"). Kim was recently elected VP of TMS, where he has worked with my business partner, Frank Nolfi. Kim was recently elected a fellow of the American Association for the Advancement of Science "for studies in defects in semiconductors and their characterization through deep level spectroscopy."

Chris Ebbe writes that water rationing is easing in southern California, but he still prays for rain! Chris recently received an award from the California Psychological Association for distinguished service to the profession. . . . **Bruce Morrison** continues to earn kudos for his work in the immigration reform bill. Bruce was recently honored with an appreciation night here in Boston because the bill greatly eased the way for many Irish natives to immigrate. . . . **Domenic Giovachino** has moved to Annapolis with his wife and one of their twin daughters, an architect. Domenic reports he continues sailing on the Chesapeake in their 38-foot sailboat. He continues to work part time for Altek, the digitizer company, and has spent much of his time redeveloping his interest in music, piano, and trumpet.

Occasionally those notes of activities sent in with your MIT contribution are really interesting and lead to great stories. **Alan Schutz** writes: "For a year I've been taking an acting class from my wife's first husband. It's given me considerable emotional self-awareness. It was also the catalyst for me to recently go on a firewalk (walking over hot coals). Quite an experience." What self-respecting class secretary could resist a call! Alan still is VP of engineering for Geophysical Survey Systems, a subsidiary of OYO Corp., Tokyo, which focuses on ground-penetrating radar. He remarried six years ago, and his wife's first husband came back to New Hampshire from the West Coast a year ago to be closer to his son and ended up moving in with them for a while. In the process, Alan developed a real interest in greater self-awareness, which led to the firewalk. Alan has a daughter, 23, now out of college, who will have her bat mitzvah this year. Alan also has sons (19 and 14). We had a great conversation, since I have had an interest in ground-penetrating radar, both because daughter Susan is in archaeology and because it holds some promise for non-invasive, in-ground environmental monitoring.

Joe Dyro was recently elected president of the American College of Clinical Engineering and a founding fellow of the American Institute of Medical and Biological Engineering. He has recently set up the Biomedical Engineering Training and Assistance program (BETA) at Stony Brook to promote Long Island and New York State conversion from defense to health care. Joe and his wife will celebrate their 25th this June, and they have three children, Carolyn, 16, Peter, 13, and Laura, 9. He reports that Laura delights her parents by playing the piano and violin simultaneously (the piano with her feet! I wonder if the Suzuki system inventors ever imagined this!). Joe has honed his skills as a tenor and last year sang "Morning Has Broken" at a funeral and earned a requisite \$15 fee. He reports

a line of older women who have signed him up for their funerals!

I finally connected with **Bill Moomaw** at Tufts. Since Beacon does a lot of activity in the environmental area (particularly Environmental Quality Corp.), I had been quite interested in learning more about Bill's activities at Tufts. He is the director for the Center for Environmental Management and holds a dual appointment at the Fletcher School in international environmental and resource management. Bill was a chemist and became involved in teaching environmental courses in the 1970s after receiving his doctorate. He spent time in Washington in the mid-1970s, then went to Williams College to run their environmental studies program, and ended up at Tufts three years ago. One of his two children has just graduated from college and is working, the other is in his last year at the Perkins School. Bill's wife is VP of marketing for New England Baptist. He reports they do a lot outdoors—hiking, cross-country skiing, and photography.

Continue to write with news.—**George McKinney**, secretary, 33 Old Orchard Rd., Chestnut Hill, MA 02167, (617) 890-5771

66

We have some news again. **Matthew Fichtenbaum** presented a paper at the IEEE International Test Conference. He is at GenRad working on test instrumentation for digital telecommunications. . . . **William Pecora** has moved from VP of finance and CFO of Elexis Corp. to a similar position with Noven Pharmaceuticals Inc. in Miami. . . . **Calixto Romero** is enjoying the change he's made back to academic medicine as a full-time faculty member at Washington University in St. Louis.

Since we have been lacking news for awhile, I have begun calling people when I travel. I had a nice chat with **Paul Ruby**. He started his own company 10 years ago, Parker Benjamin Inc., which he calls an investment banking "boutique." The company finds financing for the middle market and startup companies looking for venture capital. He is happy to have survived in Connecticut's currently depressed business environment. He and his wife have three children, 5, 10, and 12 years old. Also chatted with one of the twin 17-year-old sons of **Anilkumar Mody**. Dad is a senior nuclear engineer at Combustion Engineering in Windsor, Conn., plays a lot of tennis, and spends "quality time with his sons." Pretty good endorsement. If you don't trust your children to answer questions about you, better write yourself!—**Eleanor Klepser**, secretary, 84 Northledge Dr., Snyder, NY 14226-4056, e-mail: vismit66@ubvms.cc.buffalo.edu

67

When **Donald Paul** was asked to give a talk last year to a group of oil exploration scientists, he did not realize that his speech would turn out to be a rough blueprint for a new Chevron Corp. subsidiary that he was recently tapped to lead. In his speech he cobbled together some thoughts he had saved through the years on the future of oil industry research. "I had been building an inventory of things that I thought I could change. I just had no idea that I would have an integral role in carrying them out so soon," he said. The new Houston-based subsidiary, the Chevron Petroleum Technology Co., combines Chevron's five oil and gas research and technology units into one company. The merged unit will have 1,100 employees, roughly 450 fewer than the current staff. The merger is another step in Chevron's two-year-old restructuring and is expected to save \$60 million annually in operating costs. Donald has worked for Chevron since he received a PhD in geophysics from MIT in 1975.

Ron Norelli has been elected Chairman of CEM Corp. in Matthews, N.C. . . . **John Rudy** writes that he has begun hiking the New Hampshire 4,000-foot

mountains and has so far conquered 17 of them. On his last trip to the top of Mt. Tripyramid, he didn't see anyone, and then, within five minutes, he encountered five MIT people. On the business side, John has taken responsibility at Raytheon for CALS software, a major Department of Defense initiative to standardize and make data more accessible to the Department. In September John and Janice had a mini Baker House reunion at their home in honor of Nancy and Ed Geltman, who were visiting from St. Louis and had been unable to attend our 25th Class Reunion because Ed was giving a paper in Australia. The mini reunion was also attended by Elaine and Joel Schwimer, Elaine and Jeff Wiesen, Monica and Chuck Cooper, and Barbara and Gary Englander.—Charlotte and Jim Swanson, co-secretaries, 878 Hoffman Terrace, Los Altos, CA 94024

68 25th Reunion

As you read this, the gala 25th Reunion is within two months! If you have not received any information about it, please contact us immediately. We hope to see you all in Cambridge June 3-5! ... Our thanks to Bob Metcalfe for his generous matching gift, which should be very helpful in pushing our Reunion Gift over the top.

The letter-of-the-month award goes to Jay Hellman, whose letter is fascinating but must be summarized here due to space limitations. Jay has been very creative in Washington, D.C., area planning/real-estate development since 1980. If you saw the inaugural parade, you probably saw his great restoration of a charming 19th-century building on Pennsylvania Ave. for Sear's D.C. office. He credits his insights in planning in part to Professor Fano's course on social impact of technological change and Professor Forrester's dynamic feedback theories, e.g., "Everything is related to everything else." One of Jay's major accomplishments is the Lafayette Center in D.C. (where Mike's health club is), a five-building complex that resulted in the development of more effective zoning tools that have been used in more than 20 other projects. Another is an outer suburban project in Charles County, Md., that involved in both ecological innovation and a demonstration of Jay's theory of Virtual Adjacency®—using computers and communications to help in many office tasks without actually having all the staff adjacent.

From Scarsdale, N.Y., we hear that Faye and Jack Gingold have two "healthy, wonderful" children—Julian, 7, and Lisa, 5. Jack started and is president of a company specializing in the marketing of police vehicles in the U.S. and abroad. ... Craig Cervo has moved from Interleaf, Inc., in Cambridge, Mass., farther away from the Great Dome to Applix, Inc., in Westborough, Mass., where he is VP.

Since 1978, Rick Ehrenkranz has been a member of the Yale Medical faculty. He is a professor of pediatrics and clinical director of the Newborn Special Care Unit of Yale-New Haven Hospital. He's planning a sabbatical in health policy starting this fall. His wife, Ellen, is a CPA with her own practice, and their sons, Jeff and Peter, are students at Tufts and Yale. ... George Phillies continues to shepherd a growing research group on complex fluids and is working on a science-fiction novel.

The consulting partnership of Marilyn and Ron Rosen was awarded a National Cancer Institute small-business promotion grant to develop computer software for breast and cervical cancer screening, with Sloan-Kettering as a subcontractor, an unusual twist! ... From Pittsburgh, Barry Mitnick writes that he and Margy are quite busy. He wrote 40 percent of and edited a book on corporate political activity which is in press, is writing/presenting papers, teaching, doing service work in the area of Downs syndrome, helping out two Little League teams, and fixing magic tricks for his 9-year-old's magic show business.

Jeanni and Dennis Sager's oldest child, Lauren, 19, is a sophomore at Princeton and 1991 Jeopardy! Teen Tournament contestant. Their other children,

Deborah, Michael, and Jill, are 15, 10, and 8, respectively. Dennis practices internal medicine in nearby Reston and is chair, Department of Medicine, and secretary of the medical staff at the Reston Hospital Center.

So you think you have a long way to come for the reunion. ... Adebayo Ajadi has replied from Port Hartcourt, Nigeria, that he is planning to come! After receiving an SM in Course X, he is still in the same field. From 1969 to 1976, he worked for Allied Chemical, Celanese, and Scientific Design Co. in the New York/New Jersey area on process design and engineering. For the past 16 "fulfilling" years, he has been with the Nigerian National Petroleum Corp., where he has played leading roles in natural gas distribution, LNG, and petrochemical projects, particularly a large ethylene-based grass-roots complex now under construction. In November 1991, he was elected a fellow of the Nigerian Society of Chemical Engineers. He has traveled widely, mainly on business activities. He would be interested in contacting classmates interested in business opportunities in Nigeria, especially in the petrochemical area.

That's all for now. See you in June.—Gail and Mike Marcus, secretaries, 8026 Cypress Grove Ln., Cabin John, MD 20818

69

Peter Busch writes, "Still living in New Jersey with my lovely wife and three children. Have been school board president for three years and keep generally quite busy." ... Tom Imrich has just completed first pilot qualifications for FAA inspectors in the new Airbus A340 to be introduced at Northwest Airlines this spring. He is spending a lot of time writing FAA's new criteria for flight management systems, GPS (Global Positioning System for satellite navigation) and data link. His next big project will be operational aspects of certification of the new B-777. Son Tom is about to graduate from the University of Washington in aeronautical engineering. Daughter Janice is filling out college applications for next fall. Tom ends with the refrain that we boomers all relate to, "Can you believe how time flies!"

Nick Laurence of Plano, Tex., writes: "I've been very active with SBIR contracts over the last few years. Specialty areas include ANNs and synthetic intelligence. I run a 'distributed company,' with people living all over and working via telecommuting. This year I plan to summer near Yellowstone and winter on South Padre Island, Tex. Wherever there's power for my computer and a phone, I'm in business!" ... A note from the ether tells me that Steven D. Lipsey is now VP of Mathworks, Inc., in Natick, Mass. Formerly he was VP of marketing for Reflection Technology, Inc., in Waltham, Mass. ... William M. Saidel has been appointed to the biology faculty of the College of Arts and Sciences at Rutgers University, Camden. He lives in Cherry Hill with his wife, Joan, and two children, Jeremy, 15, and Emily, 9. Prior to this appointment, Saidel taught and conducted research at the University of Maryland. He also taught at the University of California and Georgetown University.

Next month I travel to Japan as an invited guest of the Japan Science Foundation to participate in the 12th Science and Technology Forum in Hikone, Shiga Prefecture. The theme of the gathering is, "In the Pursuit of Dreams for Science and Technology." There will be lots of discussion of cold fusion.—Eugene F. Mallove, secretary, 171 Woodhill-Hooksett Rd., Bow, NH 03304

70

The Reverend Janet Mangold Landwehr writes that she has been pastor of Grace Lutheran Church in Freehold, N.J., for five years and that under her leadership it has completed a major building expansion project. Last year Janet was appointed

by the bishop of New Jersey to chair the statewide committee on Lutheran campus ministry and was elected by her colleagues to the Lutheran Church's statewide governing board. In her spare time, she is working on a doctor of ministry degree at the Philadelphia seminary.

In an ecumenical vein, Jeff Hankoff tells us that he has the "dubious honor/distinction" of being president of his local Young Israel Synagogue. Jeff has lived in the Santa Barbara, Calif., area for 11 years with his wife, Jane, and their two children, Bobby (13) and Essie (11). He is a family practitioner in a multispecialty clinic, the Santa Barbara Cottage Hospital.

Sonal Jhaverib brings us up to date on her life since graduating in physics. Sonal received a graduate degree in anatomy from Harvard in 1978 and since then has done research on brain development, specializing in the growth of sensory systems. In 1977, she married Jerry Schneider. They have two children, ages 8 and 13, and live in Brookline, Mass.

Mike Bennett sends us a note from halfway around the world. Mike says that he has been living and working in New Zealand for the last four years conducting computer training programs for Victoria University and consulting on financial systems. Last year he took a leave of absence in Australia, where his wife, Diane, spent a semester doing research at the Australian National University.

Michael Hurst tells us that nothing stays the same as he begins chapter 3 of his life. In chapter 1 he was a professor at Boston University Medical School, where he is still on the adjunct faculty. In chapter 2, covering the last 14 years, he built a company that he sold to American Psychmanagement/Value Health, Inc. He predicts that chapter 3 will include more time for his family: wife Renee, daughter Michelle (14), daughter Rachel (3), and son Jimmy (2).

David McLwain writes that his long-standing interest in recombinant DNA has led him to be the program co-chair of the MIT Club of Washington seminar series on the human genome project, gene therapy, and recent advances in molecular biology. His wife, Ann, worked on funding for the Clinton presidential campaign. Their son, Benjamin, is 7 and daughter, Samantha, is 5.

Two brief notes: Bob Berman and his wife, Marilyn, are celebrating the first birthday of their daughter, Anna Eleanor, on April 22. ... Ed Sayer is a full-time clinical psychologist and part-time financial planner and investment advisor.

Two unrelated press releases tell us about Stephen Shalom and Alain Hanover. ... South End Press has published Stephen's *Imperial Alibis, Rationalizing U.S. Intervention After the Cold War*. ... Alain, who has been the chair, president, and CEO of Viewlogic since its founding in 1984, has been named vice-chair of the Massachusetts Microelectronics Center, a partnership of the Commonwealth of Massachusetts, 12 Massachusetts universities, and 60 companies supporting technology education and development.—Greg and Karen Arenson, secretaries, 125 W. 76th St., Apt. 2A, New York, NY 10023

71

Jeffrey D. Beck writes: "I am a senior member of the technical staff at Texas Instruments, Inc., in Dallas. I work in the Infrared Devices Laboratory of Central Research Laboratories, where I develop advanced IR focal plane arrays. ... Peter E. Brumme is executive VP and COO, sales and marketing, of Software Developers Co. in Hingham, Mass. ... Nancy Liebman Rosenfield is a product development manager at Harte-Hanks Data Technologies. Her husband, Don ('69), is senior lecturer at MIT. They live in Lexington, Mass., with their three children: Adam, 6, Todd, 14, and Jennifer, 18, a freshman at MIT.

Gary Lantner is head of the Facilities Planning and Engineering Department of United Airlines, having headed similar departments at Republic

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The

Ocean and MIT

Morning Lectures

9 AM Kresge Auditorium

Sylvia A. Earle Co-Founder and Director, Deep Ocean Engineering **Exploring the Ocean with Unmanned Vehicles**

Robert C. Spindel Director, Applied Physics Laboratory, University of Washington **Measuring the Ocean Environment**



Carl I. Wunsch '62 MA
Professor of Physical Oceanography **Effects of the Ocean on Global Climate**

William I. Koch '62 CH
President, Oxbow Corporation and Winner of 1992 America's Cup **The Management, Technology, and Victory of an America's Cup**

Afternoon Panel Discussions

Ocean Recreation and Sports

Moderator – Louis W. Cabot, Director Emeritus, Cabot Corporation

Jerome H. Milgram '61 EE
Professor of Ocean Engineering

Peter A. Quigley '85 OE
President, Fiberspar, Inc.

Edward S. Van Dusen OE '70
President, Composite Engineering, Inc.

Donald Liu '66 OE Senior Vice President, American Bureau of Shipping

New Ocean Technologies

Moderator – C. Chrysostomidis Professor of Ocean Science and Engineering

J. Robert Fricke OE '91
Assistant Professor of Ocean Utilization

Marcia McNutt Professor of Geophysics

Martha L. Gray HS '86
Associate Professor of Electrical Engineering

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Technology Day

June 4, 1993

Josko Catipovic 80 OE
Associate Scientist Woods
Hole Oceanographic Institute

New Naval and Maritime Missions

**Moderator – CAPT
Randolph M. Brooks, USN
OE '76** Professor of Naval
Construction and Engineering

Ira Dyer '49 PH Professor of
Ocean Engineering

John M. Deutch '61 CH
Professor of Chemistry

Harvey M. Sapolsky
Professor of Public Policy and
Organization

**RADM Malcolm
MacKinnon III, USN (Ret)
NC '61** former Chief
Engineer, United States Navy

Oil Spill Issues

**Moderator – Henry S.
Marcus OE '67** NAVSEA
Professor of Ship Acquisition

ADM J. William Kime NC
'64 Commandant, United
States Coast Guard

**Epaminondas G. E.
Embiricos '64 OE**
Chairman, Embiricos
Shipbrokers, Ltd.

Lissa Martinez '76 OE,
Consulting Marine Engineer

Richard J. Quegan General
Manager, Marine Department,
Texaco, Inc.

Art Direction: Claudio Luis Vera
Digital Artist: Matthew Winston

Photography: wave, Woody
Woodworth, Creation Captured:
America's Cup, sailor photos, Donna
Coveney; sonar imagery, Woods Hole
Oceanographic Institute.

Airlines, Eastern Airlines, and Continental Airways. . . **Mike Gilmore** remarried in 1989 to Jo Pickford of Fresno and Boise. They had a daughter, Laura, in 1990 to join Jo's three other daughters: Kim, Kekatie, and Hillary. Four days before Christmas 1991, they moved to a new house. They have no major plans for 1992.

John C. Eichelberger left Doe Lab Land for academia and about as far north as he could go—Fairbanks, Alaska. He says winters are a tad tougher—he doesn't recall much skiing in Cambridge in September or May. Spurr is erupting, so these are exciting times for volcanology. . . . **Gus J. Vlahakes** has settled in Boston with his wife, Kathy, and their 4-year-old twins, John and Alexandra. He is associate professor of surgery at Harvard and on the cardiac surgery staff at Mass. General.

Adrian Bejan (MIT, '71, '72, '75) was awarded the title Doctor Honoris Causa by the Bucharest Polytechnic Institute on October 27, 1992. He is currently J.A. Jones Professor of mechanical engineering at Duke University. . . . Have you noticed that our bodies are beginning to fall apart? I just finished my fifth ankle surgery, hopefully the last, and it is a lot harder to walk on crutches at 42 than it used to be.—**R. Hal Moorman**, secretary, P.O. Box 1808, Brenham, TX 77834-1808

72

As I write this I have recently returned from four and a half months in France. For those who sent news directly to me during that time, I apologize for the fact that my mail has been piling up unanswered for so long, but now we can catch up. It was interesting to watch the U.S. elections in France, with their slant on our presidential politics. It is all over now but for the inauguration, and by the time you read this column, Bill Clinton will be well on his way to his first 100-days mark.

Joe Litten has started his own firm, Litten Financial Consulting, structuring municipal bond transactions. So far most of the work has been housing bonds, but he hopes to expand into other areas. . . . **Rafael L. Bras** was named head of the Department of Civil Engineering at MIT effective last July 1. He previously was director of MIT's Ralph L. Parsons Laboratory for Water Resources and Hydrodynamics for about eight years.

Marjorie K. Jeffcoat was appointed the Rosen Professor and Eminent Scholar at the UAB School of Dentistry. She has been chair of the Department of Periodontics since 1988. . . . **James Davis** and his wife, Jill, recently visited Russia, where he addressed a Flight Simulation Conference in near-by Zhukovsky. With few exceptions, the people they met were warm and cordial. All were concerned with the sorry state of their economy. Afterwards they vacationed in the Rhine Valley, where James noted "the contrast of technology and state of repair was dramatic!"

Kathy Swartz sent in further details of her move back to the Boston area. She is teaching in the Department of Health Policy and Management in the Harvard School of Public Health. Her husband, Frank Levy ('63), is teaching Course XI at MIT, as is **Paul Levy**, potentially causing some confusion. In October 1991, Kathy won the David Kershaw Award from the Association for Public Policy Analysis and Management. It is given every other year for research done by a person under the age of 40 who has had a substantial impact on public-policy issues. The award cited her work on people without health insurance and its impact on drawing attention to the need for expanding financial access to healthcare. The move seems to have gone fine, although Kathy thinks it will be a year before everyone, including her 14- and 11-year-olds, feels settled. . . . **Richard B. Gibson**, Lt. Col., USAF, joined the Air Force Studies and Analyses Agency in June 1992.

John Kavazanjian is currently working as senior VP of operations for Kendall Square Research, a manufacturer of parallel computers based in

Waltham, Mass. . . . **Alan Michael Cooper** recently started a full-time position at Central VA Training Center, a 1,250-bed facility for the mentally retarded. Thus far, it's proved challenging and exciting. Nearly half of his time is spent educating the staff, an activity he enjoys. He also notes, "Our 2- and 4-year-old daughter and son continue to delight us and to ensure that we don't sleep excessively."

Marc Alpert is currently seeking information on the whereabouts of the famous author Irwin T. Lapeer from MITSFS. Can anyone help him? . . . **Andrew Himmelblau** is making plywood adhesive from wood (instead of oil) as president of Biocarbons Corp. in Woburn, Mass. . . . **Thomas W. Eagar** and a former student won the Henry Marion Howe Medal of ASM International for writing the best paper published in *Metallurgical Transactions* last year. Tom is director of the Materials Processing Center and a professor in Course III at MIT.

Well, send in your additional news.—**Wendy Elaine Erb**, co-secretary, 6001 Pelican Bay Blvd., Apt. 1003, Naples, FL 33963

73

20th Reunion

Bill Letendre writes that he has left CNR Inc. in Needham after 13 years building advanced military communications systems. He is now working for his old friend Kevin McCarthy, '75, as director of engineering for New England Affiliated Technologies in Lawrence, building precision positioning systems for a variety of applications, and "commuting from Brookline by bicycle and commuter rail."

Doran Holzer has left BP to go to work for the Society Corp., a Cleveland banking company, as director of financial systems. . . . **David Reed** has recently left Lotus after seven years as VP and chief scientist to join a company called Interval Research, doing "long-term, precompetitive research" in computer and communications technology. At 40, he said, it felt like the time to invest his energy counteracting the trend toward research cutbacks.

Edward Nowak is "pushing back the frontiers of semiconductor technology" and resisting being restructured out of a job. He enjoys family life with daughters Beck ('04) and Julie ('06).

A few replies of "I'll be there" at the reunion came with notes I would like to pass along. **Kevin Trangle** is president of Business Health Management, an occupational and environmental medicine firm; he is married with three children. . . . **Tom Ellis** and his wife are still both employed at Hughes Aircraft in California. They have two boys, Matt and Kevin. . . . **John Chandler** is moving to apple country in Harvard, Mass., where he will have a view of Mt. Wachusett from his front door.

David Moylan recently cowrote and coedited a text, *An Introduction to Radiation Oncology*. . . . **Mike Wargo** was chosen by the NASA Select cable channel to host a daily show on a recent shuttle mission. The show's producer noted for *Tech Talk* that he even "sang us a few MIT songs—off camera."

Erik Tavzel, a senior, has once again been awarded the Class of 1973 Scholarship. He will graduate with a degree in economics and pursue a law career.—**Robert M.O. Sutton, Sr.**, secretary, "Chapel Hill," 1302 Churchill Ct., Marshall, VA 22115

74

Please send news for this column to: Co-secretaries: **Lionel Goulet**, 115 Albemarle Rd., Waltham, MA 02154-8133; **David Withee**, 1202 Linden Dr., Mt. Pleasant, IA 52641

75

Please send news for this column to: **Jennifer Gordon**, secretary, c/o Pennie & Edmonds, 1155

Avenue of the Americas, New York, NY 10036; or 18 Montgomery Place, Brooklyn, NY 11215

76

Our thanks to those of you who have sent news. However, we still need, and have room, for more. Please send! . . . **Daniel Franklin** writes: "Still working at Bolt, Beranek & Newman, on BBN/Slate (an integrated document preparation and mail system). My wife, Mary-Beth Santarelli, and I are expecting the birth of our first child around election day." . . . A laconic message from **Michael Ryan**: "Working for Costain Coal in Gnadenhutten, Ohio." . . . **David August** pens: "Life continues to go well. Barbara, my wife of two years, and I are expecting our first child in March. I remain on the medical school faculty in the Department of Surgery at the University of Michigan, and I've had opportunities to host both old and current Burton Third Bombers on their sojourns through Michigan."

Gwendalyn (nee Champion) Baumann: "Busy with family—Paul (husband), Karl (7), Eric (4), and Natalie (2). Teach part time organic chemistry at Armstrong State College, involved with science education at primary school and local science museum." . . . **Thomas Downey** has moved within Bolt, Beranek & Newman to the BBN Communications Division, as director of planning. "My old house continues to occupy any free time that isn't devoted to the kids." . . . **Mauri Rosenthal** writes: "New daughter, Sarah Caitlin Rosenthal. Son, Alex (6) and wife, Nancy Taubenslag, all doing fine. Still working for Pfizer's Medical Device Business. Serving second year at MIT Education Counselor for Scarsdale (N.Y.)."

Fred Tsuchiya: "Still a project manager at MTS Systems. Working on a composites program with ACP/T11, a company part owned by **David Maass**. Coached son Karl's soccer team to fourth grade championship. Skating instructor for son Grant's hockey clinics. Alison (2) is growing fast. Wife Kandis, Simmons '77, is busy with physical therapy work in schools. Had **Joe Tavormina** visit last summer. He's starting a new company with former Professor Fischer."

Brian Buscher has been elected a partner at Booz, Allen & Hamilton, the international consulting firm. Brian is with Booz Allen's London office, where he is a specialist in strategic systems design and cost restructuring for travel/tourism and FMCG industry clients in Europe. Prior to joining Booz Allen in 1984, Brian was senior VP for publishing services at a microcomputer software firm, where he was responsible for marketing/sales management and software development.

Professor **Fred Walter**, SUNY/Stony Brook Department of Earth and Space Science, has received two awards from the Goddard Space Flight Center for his work on the NASA Hubble Space Telescope Project. Walter received the center's Certificate of Achievement and Group Achievement awards. He is one of 13 co-investigators on the team that built the Goddard high resolution spectrograph, used to observe stars, galaxies, and other astrophysical objects. . . . **David Agans** was in the *Keene* (N.H.) *Sentinel* as a candidate for public office. He was running for the District 5 seat for the New Hampshire Executive Council on the Libertarian Ticket. Unfortunately, no one has written to your secretary with the election results.

As for your secretary, he continues to trade; we live in exciting, volatile times, which are ideal for trading. I suspect the concept of "investing" completely died in 1992 when IBM went from \$100 to under \$50 per share. My observation is that people tend to call "investments" their unprofitable trades! These times continue to demand agility, be it in trading or in my other, now primary profession, telecommunications and computerization. One virtue of our education that has been amply clear to me is our training in how to learn. It allows me to stay current and use a flood of technology. I

believe that this skill will be of every increasing use, as the technology flood seems to still be accelerating across a broad spectrum of fields. . . . Please write, fax, or call. We need your news.—**Arthur J. Carp**, secretary, Quantalytics, Inc., 220 Henley Rd., Woodmere, NY 11598-2523, (516) 295-3632, Fax: (516) 295-3230

77

Here's a humble request from you humble secretary as vacation season approaches. Please send me a postcard from your next trip/travel/vacation, preferably with a pretty picture and a witty note, and I'll be sure to acknowledge it (and you) in our end of the year issue. I'm looking forward to hearing from a record number of classmates this year—don't let me down!

Elliot Lach and **Tammy Harris** are happy to announce the recent birth of their daughter, **Rebecca**, new sister to **Jeremy**. They were planning to move to a new home that they built in Framingham, Mass. . . . **Matthew Sherman** recently joined the Clinical Development Group at Genetics Institute in Cambridge while maintaining his faculty appointment at Harvard Medical School as assistant clinical professor as well as his hospital appointment at the Dana-Farber Cancer Institute. . . . **Phuong Trinh** writes that he enjoyed visiting **Rob Cotta** during the 15th Reunion. He noted the multitude of changes at the Institute—but, **Phuong**, I'm afraid the Tech Coop had a perfume counter even when we were students! **Phuong's** medical practice added a fourth associate in July 1992 in infectious diseases/internal medicine.

The last piece of news this month is from **Jill Kern**. She writes, "I married **John Faricelli** on June 2, 1990. He is an engineer from Cornell, working in Digital's advanced semiconductor development group in Hudson, Mass. I'm a quality consultant for Digital in Stow, Mass. I also am a VP of the American Society for Quality Control in my 'spare time.' I had a mini-reunion of some French House folks over the summer: **Dan Halbert**, '78, and his wife, **Carole Slipowitz**, (they had their first child, **Emma**, last November), and **Barbara (Slocum)** and **Jim Miller** (both '76)."

Paul Hertz and I and the children just returned from a Christmas trip to Massachusetts. We were pleased to spend some time with my cousin, **Frank Tino**, '82, and his family. We discovered a mutual interest (addiction?) to *Star Trek: The Next Generation*. Do any of you share this obsession? Please use this or any excuse to write, or I might be reduced to having my 10-year-old daughter guest write this column for me during slow news months. (Quite a threat, right?)—**Ninamarie Maragioglio**, secretary, 8459 Yellow Leaf Ct., Springfield, VA 22153, (hertz@xip.nrl.navy.mil)

78

15th Reunion

I am sad to report the death of **Peter Berke**, who passed away last November. You may remember Peter as president of the Undergraduate Association during our junior and senior years. Through this office, Peter worked hard to make life around the 'Tute more fun, and to reduce the effects of the factionalism that existed. Our condolences to his family and friends. Peter was a consultant and living in Santa Monica, Calif., when he died. . . . We also received notice of the August 1991 death of **Guy Emanuel**. He was living in Lithonia, Ga., at the time. Any classmates or friends with more information to share about Guy may write the class secretary.

We have news from many classmates who've responded to the reunion mailing with their class dues or with their contribution to the 1978 Reunion Gift. Just maybe they'll be at our 15th Reunion—make your plans now!

Manuel Casiano writes, "I have been in general surgery private practice for almost six years now. It

will be interesting to see what direction the country heads with medicine under the new administration. My two children (**Rachel**, 2, and **Chris**, 7) are both doing fine—soccer season just ended. My wife **Carmen** is great. I visited Boston briefly on business last week, and got nostalgic while walking the Freedom Trail. There have been lots of changes down Boylston Street in the past 14 years!" **Manuel** and family are living in Frederick, Md. . . . **Lucy Everett** sends us news from Richmond, Va.: "I am an internist-turned-anesthesiologist, practicing primarily pediatric anesthesiology and teaching at the Medical College of Virginia." . . . **Gary Asakawa** writes that he is an electrical advisory engineer for INTELLISTOR in Longmont, Colo. He designs hard disk drive hardware. Gary lives in Colorado Springs, Colo.

Jeff Rubenstein brings us up to date on life in the wilds of upstate New York: "I've been elected president of the board of trustees of the Museum of Science and Technology (M.O.S.T.) in Syracuse. It's a hands-on science museum complete with a brand new planetarium and plans for an omnitheater and a major expansion next year. I am still living on the farm in Erieville, N.Y., with my family of one wife, one goat, two sheep, two dogs, four cats, and 30 horses. Three babies are expected in the spring. I got my multi-engine pilot's license last year, so I spend my spare time now punching bigger holes in clouds." . . . **Paul Mort** is no doubt keeping busy. He says, "My wife, **Susanne**, and I have two daughters: **Sophia** is 2 years old and **Elsie** is 9 months old. In between parenting chores, I am working on completing a PhD in ceramic science and engineering at Rutgers University." Paul and family are living in East Brunswick, N.J.

Theresa (Costanza) Nolet writes, "The family is keeping busy and enjoying our location in the Bluegrass area of Kentucky. Since we are within easy driving distance of Huntsville, Ala., the entire family attended Parent/Child Space Camp last June. We loved it! Catherine (age 10) and I got the "Right Stuff" Award. We flew two simulated shuttle missions, built and launched model rockets, and learned a lot. Highly recommended! On your way through, stop and visit us! We (**Dan**, '77) and I are still at Corning's plant in Harrodsburg, Ky." . . . **Richard Ware** sent news of a job change. "I am no longer at ARC Science Simulations; I now work at Arrakis Systems in Fort Collins, Colo. Arrakis makes digital audio hardware and software for radio stations. My wife, **Marian**, our children—**Paul** (almost 5), **Alice** (almost 2), and **Molly** (15)—are happy and healthy." . . . **Bill Fejes** writes with good news. "My wife, **Althea**, and I had a son, **William**, in July 1992. William joins two daughters, **Jessie** (5) and **Stephanie** (3). I'm working for Pacific Scientific Motor Control Division running the controls part of the division in Charlestown, Mass." Bill and family are living in Boxford, Mass.

Richard Field sends his news along with some cryptic communication. "I'm the engineering liaison at Novacad but, most of all, I'm daddy of three—**Dickie**, **Eliana**, and **Abby**. Not bad for an old NRSA gnrud! Hi Jean! I saw your note. Where's Nino? I see Limp."

Gerald Epstein writes, "I am back at the Office of Technology Assessment in Washington, where I am directing a study of the proliferation of weapons of mass destruction. Last May, the book I co-authored while at the Harvard Kennedy School of Government (on the relationship between military and commercial technology) was published: *Beyond Spinoff: Military and Commercial Technologies in a Changing World*. Since leaving Harvard, I have established another connection to the academic world by commuting up to Princeton one evening a week to teach a graduate course on arms control and nonproliferation. My family is doing fine. My wife **Ellen** is readjusting to life in D.C. after three years in Boston, and **Alanna** (5) and **Nathan** (3) are in that fleeting interval between toddler and teenager."

Scott Golden's still in his own law practice in Fort Lauderdale, Fla. He says, "My wife, **Jane**, keeps busy with **Danny** (10), **Kimberly** (7), **Molly**

the cat, and **Lady Sheila**, the golden retriever puppy. Between the puppy and the new basketball hoop in the driveway, I guess we qualify as an All-American Family!" Scott and family welcome classmates to drop in to shoot hoops in Hollywood, Fla. . . . **John Troiani** was recently elected to fellowship in the American Academy of Pediatrics. John lives in Marquette, Mich. . . . **Richard Bradford** writes us from Westford, Mass.: "I'm a software consultant, happily married with four wonderful kids. I'm now still wondering how I'll pay for it if they all end up at the 'Tute. Of course, I'd love to actually have that problem!"

Thomas Dae Young Chung writes that he and wife **Barbara** are expecting their first child. Tom and family are living in Lambertville, N.J. . . . **Geoff Baskir** and wife are expecting their first child in March. He says, "I'm still at Parsons Brinckerhoff working on the two Washington airports (Hey, **Rich MacKinnon**!)." . . . **Rich Renner** sends us news from New Philadelphia, Ohio: "I have been a legal services lawyer for six years now. I am Regional VP of the National Organization of Legal Services Workers, my union."

Ken Lesley and wife **Cathy Osman** have been on the move: "Cathy was transferred to Washington, D.C., and reported to Bolling AFB in early December. We will play gypsy for a while until we settle down. I will be looking for work again, thanks to the U.S. Navy." . . . **Sue Ann Hanson** now lives in Grosse Pointe Parke, Mich. (your class secretary's old stomping ground from high school days), working from home while with her current company for which she was working in Washington, D.C. Sue says, "A move to Motown has got to be good!" . . . **Neal Rockowitz** writes, "I'm enjoying solo orthopedic practice specializing in total joint replacement. I'm staying competitive in tennis, playing the 35s age division. I'm ranked #2 in Phoenix, and #4 in the Southwest. Life's a challenge trying to keep wife (10 years) and kids (4 and 3) happy!"

Mike Melendez and family recently moved to Malden, Mass. "I continue to work at Thinking Machines, greatly enjoying my position—teaching." . . . **Craig Stephens**: "Now VP of Pugh-Roberts Associates, which recently became part of the PA Consulting Group, the United Kingdom's largest independent consultancy. I just returned from a two-year tour as general manager, Europe." Craig now lives in Marblehead, Mass. . . . **Mitch Weitz** was recently made a partner in his law firm of Davis & Gilbert in New York City. Mitch works on commercial litigation, with clients in advertising, public relations, and marketing fields. "I was recently in South Carolina visiting classmate **Bill Lasser**, his wife **Sue**, and their little boy, **Max** (1), incredibly cute. They are all doing quite well."

Dan Halbert and wife, **Carole Slipowitz**, had their first child, **Emma Rose Halwitz**, in November 1992. Dan says that everyone is just fine. Dan and family are living in West Newton, Mass. . . . **Bruce Nemlich** and wife **Else**: "Got a terrific Christmas present. We just got back from Guatemala with our new daughter, **Katherine Elizabeth**, born in June 1992. Katherine joins Chilean-born **Brian** (4)." Congratulations to Bruce and family, who live in Holmes, N.Y. . . . **Albert Yu** sends a note from Lynwood, Wash.: "I'm the clinical director of ICOS Corp., a biotechnology company. I'm happily hiding out in the Pacific Northwest with my wife, **Ann**, and our 2-year-old boy, **Dylan**."

Rita Russell Rosensweig contributes to the class rumor mill from Atlanta, Ga.: "I could be way off base, but I heard that **Steve Commett** became a priest." Anyone out there to confirm this rumor? . . . **David Blaker** writes, "Last year, my family and I returned to Emmaus, Pa., after a three-year stay in England. Our third child was born there. Looking forward to seeing fellow Bakerites at the reunion." . . . **Diane (Prignoli) Semmling** sent along an interesting suggestion for the reunion committee: "How about a tour of the Tomb of the Unknown Tool and a ceremonial presentation of sacrificial gifts to this anonymous nerd?!" No doubt that's just the event that the committee's been looking for! . . . **Alan**

Marcum says he's been at NeXT Computer over four years and is still loving it. Son Joshua is 2. We're all having a great time."

Your class secretary and wife **Diane Curtis** now have two mobile toddlers. Danielle (2) now says sentences that we can actually understand, and Luke (1) gets into as much mischief as Danielle.

The reunion committee is hard at work putting together a great program for our 15th Reunion in early June. Call your MIT friends and make plans to be there.—**Jim Bidigare**, secretary, 9095 North St. Rd., NW, Newark, OH 43055-9538, (614) 745-2676

79

Ed Tarney writes, "Relativity isn't the only scientific principle I heard about at MIT that has been challenged since graduation. The development of my family has modified my beliefs as well. I used to think that matter could be neither created nor destroyed. The onset of diapers changed my belief in the first half, and the nightly survey of the family room at bedtime challenges the second half." Ed works as an employee of Crucible Service Centers in Camillus, N.Y. ... **Bruce Baker** is in a technical sales position with U.S. West in Seattle. He recently designed a network for the merger of Bank of America and Security Pacific Bank. His wife, Patty, is still working three days a week and enjoying the other four with 20-month-old Cassandra. ... **Keith Goldstein** has been named director of the medical intensive care unit at Hutterdon Medical Center in Flemington, N.J. Keith is board certified in critical care as well as internal and pulmonary medicine, and did his training at Mt. Sinai Medical Center in New York. He and his wife Eileen live in Flemington with their three daughters, Elena, 6, Avia, 3, and Dayna, 1. ... **Hoyt Davidson** and Peg Miller plan an August wedding in Newport, R.I.

Bennett Golub writes, "1992 has been a year of changes for the better. Cindy and I moved into a new house in Mamaroneck, N.Y., in March. In August, Cindy gave birth to two healthy twins, Alexandra Lois and Phillip Jacob. Parenthood with twins, while challenging, has been a joy!" ... **Lee Weinstein** and wife Nancy had a daughter, Stephanie Anne, last September 12. ... **Henry Fiorentini** and wife Diana (Harvard '79) had their first baby, Henry Alexander, on September 26. (According to Henry, "he's the cutest thing in the world!") Henry's company has switched to an object-oriented language. He has been lecturing in Europe and the U.S. and is about to publish his first book on the subject.

Kenneth Murphy moved last July to Marietta, Ga., where he is a staff anesthesiologist at Kennebec Hospital. He asks, "Need a place to stay for the '96 Olympics in Atlanta?" ... **Christopher Rose**, a professor at Rutgers in New Jersey, writes: "Just recently managed to crack into some NSF funding. My boys, Stephen and Evan, are 8 and 5, respectively. Only 12 more years and I'll be wandering around a big lonely house while they're partying (in Cambridge, of course!) Academia is perfect if you've got kids and do computer-based research—the hours are so flexible." ... **Hugh Blumfeld** is an assistant professor of English at Eastern Connecticut State University. ... **Audrey (Greenhill) Lones**, husband **Paul Lones**, and 3-year-old Amy added William Robert to their family on April 22 of last year. They make their home in Cumerland, Maine.

John Stautner was promoted to VP of Aware, Inc., located on Memorial Drive in Cambridge. ... **Bengt Muten** has been named VP of Consulting Services for DNS Associates, a software and consulting company in Burlington, Mass. He is responsible for transportation studies and also spearhead the company's creation of new reseller and distribution channels, both national and international. That's all for now.—**Sharon Lowenheim**, secretary, 98-30 67 Ave., Apt. 6E, Forest Hills, NY 11374

80

Congratulations this month to **Avery Demond** and **Stephen Cabaniss**, recipients of environmental restoration and waste management (ER/WM) junior faculty awards sponsored by the U.S. Department of Energy's Office of Environmental Restoration and Waste Management. The program's objective is to increase the number of university/college and technical school faculty members and students who conduct educational development, technology development, and research in the ER/WM area. Avery, assistant professor, Department of Civil and Environmental Engineering, University of Michigan, received a first-year award for his proposal, "Manipulation of Wettability for Enhanced Removal of Organic Liquid Contaminants from the Subsurface." Stephen, assistant professor, Department of Chemistry, Kent State University, received a second-year renewal for "Colloid and Particle Size Effects on Contaminant Speciation."

Christopher Dunn and his wife are enjoying their baby daughter, Gina (about a year old by the time you read this). They are still living on Cape Cod (East Falmouth). Christopher enjoys meeting with MIT alums and would love to hear from other "civil/environmental types" in the area. ... **Eric Beckman** and his wife, Joanne, became the proud parents of Ariane Elizabeth on November 2, 1992 - Congratulations! ... If you're in the Houston area, look up **Matt Steele**. Both he and his wife, Randi, still work for Texaco. Matt is a finance manager performing project work for Texaco's credit card and pipeline businesses. He also helps manage crude oil and natural gas price exposure. Randi is a computer programmer supporting Star Enterprises, Texaco's joint venture with Saudi Aramco. Their two sons, Joshua (3) and Norman (almost 2), keep them busy when they're not at Texaco.

After 11 enjoyable years with Exxon Co. USA in Louisiana and Houston, **Gerald Appelstein** has joined Star Supply Petroleum as an oil broker in the feedstocks division. Gerald, his wife, Petra, and their three children, Jessica (8), Jason (5), and Janna (3), are living in Wayne, N.J., and are happy to be closer to their hometowns and their families.

It's with sadness I report the death of **Thomas Colten** after a 10-month battle with a brain tumor. Thomas was a manager of pricing and planning at COVIA in Rosemont, Ill. He is survived by his wife, Susan, and children, Sarah (3) and Gregory (2). Our condolences to his family and friends.—Please send your news to: **Kim Zaugg**, secretary, 2384 Leslie Cir., Ann Arbor, MI 48105, (313) 665-2365, vayda@erim.org

81

Please send news for this column to: **Mike Gerardi**, secretary, 1515 S. Flagler Dr., #1204, West Palm Beach, FL 33401, (407) 655-5050 (w), (407) 835-9013 (h)

82

I reviewed my Class Notes submissions against the actual notes that appeared in the *Review* and found a few items missing. ... **Walter Luthiger** recently was deployed aboard the submarine USS *Chicago* for six months to the Western Pacific. He will participate in various operations and training exercises as well as the 50th anniversary of the Battle of Coral Sea in Australia. ... **Marissa Martinez** writes that after nine years in New England, she moved to Seattle. She and her partner, Kathleen Benson, bought an affordable house last March. They traveled to Cambridge for WILG's alumnae dinner and caught up on classmates that she had not seen for years. Two years ago, Marissa started as a software design engineer testing languages at Microsoft, and she was recently promoted to a lead position.

Brian Moroney, an old friend, is still at BP and

recently took a position trading options and futures. He deals with refinery assets through the wholesale channel. He's been married for over three years, and he and his wife, Chris, recently moved into a house that they built. ... I received a Christmas card from **Mary (Britt) Oehler**, who married Jeff Oehler, '81, during the summer of 1982. After working for Procter & Gamble for several years, both Mary and Jeff entered and completed medical school. Mary is in her last year of residency and is planning to do a fellowship in neuro-radiology at Ohio State University next year. ... **Stephen Gildea** finds himself back at the 'Tute, this time as a staff member. He is a researcher at the MIT X Consortium, part of the Laboratory for Computer Science. The X Consortium coordinates development of the X Window System, a network-transparent computer window system developed at MIT. Friends are invited to contact Stephen by writing c/o MIT or by sending e-mail to gildea@mit.edu. ... **Winthrop Cody** writes that he and his wife, Linda, had a baby daughter, Helene Marilyn, last October 26.

Michael Isnardi is working at the David Sarnoff Research Center in Princeton, N.J., where he is managing compressed digital television projects for clients. He lives with his wife, Catherine, in Plainsboro, N.J. ... **Miguel Mitchell** married Leslie Whelan in August 1991. He is finishing his third year as visiting assistant professor of chemistry at Oberlin College, teaching organic chemistry and biochemistry. Enjoying research, traveling, trying new teaching methods, being a whole person. He's hoping to publish a couple of short stories soon—supernatural mysteries and such.

Heidi Hammel of MIT's Department of Earth, Atmospheric, and Planetary Sciences received a 1991-1992 editor's letter of commendation for excellence in reviewing from *Icarus*, the primary U.S. journal for publication of planetary science results. ... **Judith Lightsey**, MD, has been appointed assistant chief of radiation oncology at St. Agnes Hospital in Baltimore, Md. She joined the staff of the Radiation Oncology Department in January 1992. Prior to that, she received the MD from Howard University College of Medicine, Washington, D.C., and served a residency in radiation oncology at Thomas Jefferson University Hospital Philadelphia, Pa.

Thanks to all who responded to the class directory/information update request. I especially appreciate the info for the class notes. Of the 89 responses I received, 30 people said they would communicate via e-mail with the class. I'll publish in the notes how/when we set this up.

Chris Johannesen writes that he owns a small aerospace manufacturing company in Los Angeles. ... **Jim Curme** married to Carol Tschee in August 1992. She was an analytical chemist but is now midway through earning a degree in intellectual property law. ... **Robert Powell** writes that since 1989 he has been the chief architect for Bill Gates' multimedia publishing company startup. The company recently changed its name to Continuum Productions Corp. to better reflect the continuum along which computers, communications, television, and publishing are going to converge. Bob is also doing the information and control systems for his new house. He could sure use a few more MIT engineers. Jim Zamiska, '83, just joined from Aldus. Call or e-mail him (bobp@continuum.com) if you're looking for a fun job. He loves the Pacific Northwest.

Peter Rogers is an Air Force launch controller in Space Command's 1st Space Launch Squadron at Cape Canaveral AFS. He ensured a successful launch of NASA's Extreme Ultraviolet Explorer Air Force booster on June 7, 1992. He still has many more Global Positioning System satellites to launch in 1993. ... In addition to marrying Jon Barilleaux in October 1992, **Michelle Gabriel** is a production manager at Compression Labs, Inc., maker of video teleconferencing equipment. She and Jon bought a house in Oakland built in 1915, a real money pit. ... **Roslyn Romanowski** writes that there is nothing new. Does that mean that she is still at MIT? ... **Michael Izenson** and Nancy (I

assume his wife) have three children—Ben (6), Amanda (5), and Leah (1). This year they are working with other Hanover, N.H., families to start a new elementary school, The Crossroads Academy. He is a project engineer at Creave Inc., a mechanical engineering R&D services firm and loves it!

Paula Johnson Morz married Gerry Morz in September 1991, and recently they bought an old house in Melrose, Mass. Paula is enjoying her research on gene therapy to treat cancer. . . .

Richard Auchus is finishing an endocrinology fellowship this year and is happy to be back in the lab. . . .

Andrew Goldberg married Dina Stolper in 1982 and they have a daughter, Amalya Meira, born in 1990, and a son, Alexander Raphael, born in 1991. He earned an SM in 1985 and an ScD from MIT in 1988. Andrew was a member of the technical staff at AT&T Bell Labs, Parsippany, N.J., from 1988–90. In 1990, he joined JP Morgan Investment Management, New York City, where he is currently VP.

Edmond Ho is still working with Hong Kong's Environmental Protection Department. He is the happy father of a baby girl, and his wife is due to deliver a baby boy in March 1993. . . . **David Shapiro** finished a PhD in statistics at Stanford in January. He is now looking for jobs, mostly in the Northeast and Canada. . . . **Michael Post** and his wife, Anne, are expecting their second baby in December for a total of four. Sounds like triplets to me.

Jeff Lucas' wife, Lauren, delivered a son (William) on November 1, 1991. They expect to move from Oklahoma in the summer of 1993. . . .

Rob Duncan is a physicist with Sandia National Labs and an adjunct assistant professor of physics and astronomy at the University of New Mexico. He is serving as principal investigator on a low temperature physics experiment that is scheduled for space shuttle flight in 1999. They have great snow where he is in New Mexico. He and some friends go cross-country skiing by moonlight three to five times per lunar cycle above the tree-line. It's wonderful. They call themselves the "luni-glides". He is also assistant scoutmaster for a mentally handicapped scout troop in Albuquerque, which is a lot of fun and very rewarding. His first grad student just completed a PhD at UNM. He says it's a pleasant, yet strange, feeling to intellectually reproduce. (If you like that, just wait until you try physical reproduction.) Rob becomes a one-third centenarian, plus or minus one lunar year, at 5:33 p.m. on March 15, 1993. Everyone is invited to join the celebration at his home in Monzano Mountains at the Cibola National Forest boundary. Rob, thanks for the long and informative note. No, I did not row crew freshman year, and I don't remember if we were in the same calculus class. . . . **Susan Drake** is currently living in Marblehead, Mass., and working at GE Aircraft Engines as a materials applications engineer. She would love to hear from friends still in the area.

Anne Moroney Ladd married Steven Ladd, '81, last July. She founded Cantigie Connection in 1990 for people interested in Ayn Rand. . . . **Wei Hu** is married with two children. He works at Digital Equipment Corp. and leads a group of engineers who are developing distributed computing software for the Open Software Foundation. . . . **Alison Schary** completed a PhD in electrical engineering at Cornell and is starting the job search process. . . . **Cathy Bibler** is working at IBM Technology Products in Poughkeepsie, N. Y., and teaching an in-house thermal analysis class that she developed. It's a lot of fun and she's interested in teaching it "on the outside" also. In her spare time she plays ice hockey with a women's team in Westchester County.

Chris Braun finished his first semester as a professor. Keeping up with his classes is more work than he thought, but lots of fun. . . . **Gary Fedder** is working with micromechanical systems at U.C./Berkeley and should be finishing a PhD next year. His wonderful wife, Cheryl, pays the bills. . . . **Gretchen Young** has busy since the reunion visiting Scotland (camping in the rain) and London (lots of exhibitions, cups of tea, and walking). She is settling in to a winter of work.

Gerry Fitzgerald is doing college recruiting, including MIT. . . . Congratulations to **David Andre** and his wife, Rebecca, who just had a baby, Nicholas, on October 1, 1992. . . . **Michael Rabinovitz** is part-time mathematics instructor at Montgomery College, a two-year school. He is preparing to take the qualifying exam in electrical engineering at the University of Maryland.

Mitchell Tasman is still working on a PhD in computer science at University of Wisconsin at Madison. The completion date slipped a term to December 1993. He'd love to hear from classmates who happen to be passing through. . . . **Stephen Bart** finished a PhD in electrical engineering at MIT in September 1990. He is now working in the research department at BOSE Corp. in Framingham, Mass. He married Susan Phillips (SM '84) in May 1992. . . . Since August **David Kushner** has been an assistant professor of radiology at the University of Rochester. He finished a fellowship in June in musculoskeletal radiology at Indiana University in Indianapolis. . . . **Michael Collins** has been selected to receive the R. Bruce Lindsay Award from the Acoustical Society of America at the ASA meeting in May 1993.

As for me, my days of being a full-time mommy have come to an end. I started a marketing job for Apple Computer in January. One of the best aspects of it is that I only have a one-mile commute! . . . Thanks for all of the info. It's always so great to hear from everybody. —**Helen (Fray) Fanucci**, 502 Valley Forge Way, Campbell, CA 95008

83 10th Reunion

There was a lot of news this month due to our upcoming reunion. Here it is in no particular order.

Cynthia Bedell writes that she and Mark Schmelz, '78, are getting ready to celebrate their sixth anniversary. Cynthia will finish a master's in material science at MIT in June 1993. She will then go to West Point to develop a materials curriculum for mechanical engineers. She is also looking forward to biking on Bear Mountain and skiing. . . . **Marcello DiMare** and Martitia F. Barsotti, '84, exchanged wedding vows June 13, 1992, at St.

Paul's Church in Cambridge, Mass. It's a wedding that has been a long time in coming. Martitia is a first-year resident at UC/San Francisco, while Marcello is enjoying the assistant professorship lifestyle at UC/Santa Barbara. . . . **Lyman Hurd** writes that his wife, Susan, gave birth to daughter Rebecca Helen on September 17, 1992. She'll join the previous Hurd herd of three boys. Lyman also writes that he just completed a book, *Fractal Image Compression*, with **Michael Barniley**. . . . **Chris Dunmire** is working for Boeing in Seattle, but is often on assignment on Kwajalein in the Marshall Islands. Chris writes that the weather there is a nice contrast to that in the Seattle area.

Rosa Hernandez writes that she and **Chris Griffin** are getting back into performance shape now that Chris is in town to earn a master's in education at "that other school down Mass. Ave." They plan to dance together in March with the Salvation Army Youth Arts Ministry. This will be their first duet in 10 years since performing "Reaching" in Kresge Little Theater. . . . **Eric Fleming** writes that he graduated from Dartmouth's Amos Tuck School with an MBA in June and began work as a financial analyst at ESPN in Bristol, Conn. Eric is engaged to Ellyn Zeve (Wellesley, '79), but they have not set a wedding date yet. . . . **William Lin** writes that he bought a house in New Jersey last year and that his wife, Nora, is pregnant. The baby is due in early January. . . . **Jeffrey Weiss** writes that he recently joined Goldman Sachs in New York. Previously, Jeffrey worked for McKinsey and Co. doing systems consulting for nine years.

Wendy Rowe writes that she and Pace Willison, '86, have developed a sudden interest in biology since their 3-year-old son, Eric, was diagnosed as having diabetes. Liz Bashoff ('84) was very helpful as one of Eric's doctors. Wendy spends her time at home with Eric and his 1-year-old sibling, Alex, who is starting to talk and walk. . . . **William Hirsch** writes that he completed a master's in biomedical engineering at Ohio State University in 1992 and has been granted six U.S. patents. . . . **Henry Benson** is currently working as a software engineer for Teradyne and would love to hear from old friends. He can be reached at (508) 481-3163. . . . **R.A. Schnizler** enjoys the three-block walk from his "new old house" to his interesting job at UniPress Software.

Fire!



Fire!

Run for Your Address!

HELP - US - OUT - A - GRAM

Tutoring Plus of Cambridge suffers fire. **STOP.** All records of MIT, Wellesley, Harvard, and Boston University volunteers lost. **STOP.** Need volunteers to call or write to reestablish contact. **NOW.** If you were a volunteer or know other volunteers please call. **FAST.** Thanks. **THANKS.**

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Many Lives to Live

Not many people would take on a new job at 92, but Martha Munzer, '22, is unique. She has spent her life taking on challenges, changing professions, and constantly learning. So she volunteered to become class secretary last spring when her predecessor, Yardley Chittick, found that his failing eyesight made it impossible to continue.

In a revealing passage in her autobiography, *Full Circle: Rounding Out a Life*, Munzer quotes the Indian poet Rabindranath Tagore, "Life is given us. We earn it by giving it." In fact, it appears that her determination never to stop learning and giving back to the world is the key to her vigor and enthusiasm.

Her good health must also owe a debt to Munzer's love of the outdoors and her compulsion to swim every day. In Cambridge for her 70th Reunion, she went for a dip in Walden Pond, whose waters in early June bear little resemblance to those of her Key West home. And she does her voluminous writing outdoors—even in the northeastern winters, when she wraps herself in a sleeping bag, dons gloves, and works in a sunny porch nook.

Eleni Digenis, '94, interviewed her at Reunion for the Alumnae Oral History Project, and notes that Munzer was "nothing like I expected." Digenis was ready for a hard-core, no-nonsense scientist, the proper daughter of Victorian parents. Not very likely. "There was a twinkle in her eye," reports the young interviewer, "that matched the sparkle of the rhinestones on her Keds."

Born in 1899, a few months before the turn of the century, Munzer has been in the vanguard of its many changes. One of the first women in the country to graduate with a degree in electrochemical engineering, she was later a pioneering environmental educator. Author of 10 books (the latest a history of the Friends of the Everglades), the recipient of numerous awards (most recently the Liberty Hyde Bailey



A small Martha Munzer montage, or, as she puts it, "me and some awards and some of my books some time ago."

Award, awarded in 1991 by the American Nature Study Society "for excellence, achievement, and outstanding service to Nature Study"), Munzer is still seeking ways that her life can make a difference. She happily employs the attention she garners as an activist nonagenarian to promote causes dear to her heart.

Interviewed by the *Boston Globe* during Reunion, she talked about the environment, and, as a woman who experienced an abortion when they were illegal, put in a word for freedom of reproductive choice. The same week, Munzer met with MIT Professor Sallie Chisholm, director of environmental engineering studies and of the MIT/Woods Hole Joint Program in

Oceanography, to discuss environmental education for engineers. Munzer has been pushing for engineers to study team problem-solving, as well as the life sciences and professional planning, since 1971. "Before leaving this planet," she says, she really hopes to see MIT take the lead in requiring engineering students to be ecologically astute.

Getting Started: Why Science?

Munzer's character was infused with humanist philosophy early on, when she attended the progressive Ethical Cultural School in New York City. Amid the disruptions of war, the school held its 1918 graduation in January, so young Mardie Eisman, as she was then called, had a semester of free time before her planned matriculation at Smith College in the fall.

Her favorite teacher advised her to take a course in wireless telegraphy in the interim. (Munzer muses on the fact that a "crush" on her science teacher led her to science. "If he taught Latin, I would have been a classics major.") She and her girlfriends learned to be telegraph operators, and they dreamed of making a contribution to the war effort by "sending the SOS that would Save Our Ships." Alas, an unenlightened recruiting office turned them down, and the determined young women contributed to the war effort by shovelling manure as "farmerettes."

Munzer also kept on with the wireless, and a when friend suggested she might go to MIT, it struck a chord. She based her hopes on a one-sentence reference to female students in MIT's catalogue, but when she interviewed with the dean of students, she remembers him saying, "Young lady, this is no place for you." Undaunted, she pressed him: "If I pass the exams, will you accept me?" "Then we'll have to," he conceded. So that fall, after passing an exam in calculus, Mardie Eisman entered the electrochemical engineering program, then Course XIV, choosing it

An environmental educator with rhinestones on her Keds.

because it seemed the hardest.

Difficult it was. "But I felt the honor of my sex was at stake, so I persisted," explains Munzer. "If I could do this, I decided I could do anything I wanted to."

There were no accommodations for women on campus; she credits her parents for flouting convention and allowing their young daughter to live at the Hemenway Hotel across the river for her first year. Later, she was invited to stay with family friends. For social life, Munzer's males colleagues held "smokers," where they smoked and drank and sang songs of MIT. But, "the boys did not care for MIT girls, who were considered 'greasy grinds' or their competitors," and she reports that it was the Wellesley and Simmons girls who were invited dancing at the Copley Plaza.

Two days after graduation, she married Ed Munzer, an employee in her father's silk business whom she had met on only four occasions before he proposed and she accepted. "I grew up with the idea that it was a mark of failure or disgrace to become 'an old maid.'" Soon she had three young children—a son and twin daughters—and back then, no one expected that their father would share in their care.

"Though I had originally been 'liberated' by training in a so-called man's profession, it took something as catastrophic as the Great Depression to enable me to break out of my [domestic] box and add a new dimension to my life." As the Depression tightened the financial pressures on her family, Munzer tried to find work as an engineer. But engineers were a "dime a dozen—and women engineers were valued at less than a penny a dozen." Fortunately, her old school, the Ethical Cultural School, hired her to teach chemistry and basic science, and she "was launched pell-mell on a new career."

Liberating the Teacher Within

Inexperienced and untrained for teaching, Munzer found the work difficult. "I just can't face those brats another day!" She would sob daily after leaving the classroom. "If only you can survive the opening round, you should have it made," she now tells young teachers just entering the profession. "Once having learned [the ropes], I was truly in my element."

"I wanted to connect my chemistry students with real life," she recalls. For years,



Mardie Eiseman, as she appeared in the MIT yearbook.

for example, she arranged for them to visit a coal mine in Pennsylvania. Donning lighted helmets, they descended almost a mile into the earth, walking through slush in the dark and damp to the seam, "where men spent their lives pulling out coal." She knew nothing that she did in the laboratory could match the real experience.

While teaching at the Ethical Cultural School, she set up a summer work camp, where experiments could be conducted in depth over a seven-week period. Since the camp was on a farm in the country, her nephew, a professor of biology, suggested that Munzer plan a project in ecology. "Ecology—what's that?" she inquired. Even graduating from MIT, where Ellen Swallow Richards, '73, coined the term ecology in the 1880s, had left Munzer ignorant of the fledgling science.

"Ecology is like conservation," her nephew explained. That word was familiar, so she consulted the Yellow Pages and found a listing for the Conservation Foundation. With the foundation's help, in 1952 she began educating her students—and re-educating herself—at science work camp.

She reflects in her autobiography: "I knew something about the miracles performed in test tubes, but next to nothing about earth's natural resources, from which all the miracles sprang. . . . It seems shocking to me, looking back, that so many of us in my generation were completely illiterate in this field, that I was given a high school diploma and an engineering degree without having been required to take a single course in the natural sciences."

After 25 years of teaching, Munzer became a staff writer for the Conservation Foundation—learning new skills in writing and research and continuing, in a new venue, her role as an educator. Her textbook *Teaching Science Through Conservation* (written in 1960 with Paul Brandwein), outlined a curriculum and method for teaching the principles of ecology. In *Unusual Careers*, Munzer showed all young people that they could find places in scientific professions. They could, for example, emulate the paleontologist cum oil company geology consultant who hiked 15 miles a day in Africa, with her food and equipment on her back. Munzer also wanted to bring conservation to life for urban students, who were uninspired by textbooks that illustrated the concept with discussions of contour plowing. So she went on to write several books on city planning.

When Munzer wrote *Full Circle*, she described herself as being in the winter of her life, when one hopes that the seeds planted years before will bear fruit. They did. When she was 78, the editor of her autobiography was reading from it in an adult-education writing class. One of the students recognized himself as the love of Munzer's youth, whom she had not seen since he went off to war when she was 18. Sixty years after that parting, they were reunited, fell in love all over again, and married.

Munzer has wondered if perhaps she started in the wrong profession. But in the last analysis, she decided that one's specific occupation is not what is most important. "Wherever you go," she wrote, "whatever you do, you take yourself with you. And if you live with awareness, with sincerity, and with zest in the here and now, you will be ready for next steps, no matter where they may lead." □

—SUSANNE FAIRCLOUGH

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R.A. will also be enrolling in Oxymorons Onomymous this spring. Send him e-mail at Schnitz@UniPress.COM., and feel free to address him on a first-initial basis.

Walter Daniel writes that after five years as an assistant professor of aerospace engineering at the U.S. Naval Academy, he has gone back to the "real world." Walter is currently a spacecraft, dynamics and control engineer with Ithaco in Maryland. . . .

Jeanne Swecker writes that after 18 months of doing career-broadening shift work, she is back in engineering. Jeanne's 1993 goal is to have a hurricane named after her, but she'd like it to be "good" hurricane; i.e., the kind that stays off shore. (Secretary's note: Trust me, I couldn't have even tried to make that one up.)

Brenda McDonough Anderson wrote that she and spouse Stu, '81, were expecting their first child in November 1992. . . . **Richard Michalski** married Anne Frates (Wellesley, '80) in September 1983. They now have two children, Sean and Corin. Richard currently works as a staff systems engineer at Fairchild Space in Germantown, Md. He was the lead systems engineer for the first two commercial space programs at Fairchild: ELLIPSAT (a constellation of LEO satellites) and ULTRASAT (a medium GEO satellite). Richard expects to work on other horoscope and car name-plate satellites throughout his career.

Marilee Andrew (Lyle) writes from her condo in Sydney, B.C., where she and her husband are spending three years during his PhD course. Marilee gets back to Boston for some part-time work with OASIS, a small company staffed and run mostly by MIT alumni. Marilee is publicly admitting that she hopes to swing a free trip to the reunion by doing some work for OASIS in June. In the meantime, she's hoping to go on another oceanographic cruise in February with the Institute of Ocean Sciences in Sydney. . . . **Ray Khorram** writes that his company, Arkay Technologies, is still small but has survived so far. Ray hopes to score a big hit with Arkay's latest multimedia products. We'll have to remember to hit him up as a sponsor for the 15th Reunion.

Jeff Lipton, M.D., writes that he is finishing a residency in pathology and loves living in New York. Jeff is currently looking into fellowships and is singing with the New York Gay Men's Chorus. . . . **William Bennack** writes that he and his wife, Keri (Yura), both work for Du Pont in Atlanta. They just moved down from Wilmington, Del., a few months ago and now have twin daughters, Caia and Brianna, born February 19, 1992. . . . **Barry Landau** is currently in year five out of seven in his neurosurgical residency. Barry and his wife, Dawn, have two children, Emily and Ethan. . . . **Bruce McHenry** writes that after a long struggle he abandoned his start-up, left his heart in San Francisco, and returned to MIT for a dose of reality. He is now at the Sloan School.

Eric Gold is alive and well teaching high-school math and computers at Fryeburg Academy in Maine. . . . **Cindy Pribble Kochanski** writes that she and husband Greg are busy with work and travel. They recently attended **Larry Kaufman's** and **Will Merrill's** weddings. Cindy and Greg also had a fabulous vacation in New Zealand this year. . . . **Mary Hashem** writes that she moved to Denver and would like to hear from other MIT alumni in the region. . . . **Hilton Russell** is now an instructor in the Math Department at West Point. In May 1992 he married Christina Karker of Albany, N.Y. Hilton is currently working toward a PhD in math at RPI.

Bill Flint wrote that he and his wife, Karen, were expecting their first child in early January. . . . **Diane Kara Lekas** writes that she will be finishing up her residency in ophthalmology at Northwestern University in June 1993 and starting a glaucoma fellowship in July. Diane is planning a 1993 wedding to Dean Alexandrou. . . . **Tom Grycewicz** writes that after five years of teaching electrical engineering at the U.S. Air Force Academy, he is back in Boston. Tom is doing research in optics at Hanscom Air Force Base in Bedford. . . . **Arleen (Shames) Bernhardt** was married to husband Mark

(RIT '86) in June 1992. Arleen received an MBA in the management of technology from Wharton in May 1992. She is now working at Credit Lyonnais in Manhattan.

Arleen (Roanne) Taylor writes that she married an Amherst graduate on New Year's Eve 1989. They have a daughter, Amina (16 months), and two sons, Bakari and Lateet (10 and 7 years old, respectively). Arleen and her husband both completed the University of Colorado Executive MBA Program and are living in Cincinnati working for CBIS (?). Arleen is currently completing her term on the alumni board of directors and is on the Alumni Board Committee to select people for the corporation visiting committees. . . . **Stuart Rubin, M.D.**, writes that he and his wife, Lisa, had a baby boy, Matthew Aaron Rubin, on October 10, 1992.

John Piotti and his wife, Susan, had a super year traveling and planning for the future, but details are being reserved for a future issue. . . . **Pete Fader** and wife Mina had a baby girl, Sayna Park Fader, in October 1992. . . . Other 1992 Baker daughters were delivered by Sarah Kagel and **Dave Cooke**, Sean O'Donnell and Beth Markey, '84, and Rich and **Valerie LeMay Teal**.

Finally, **Mike Santullo** recently found himself face to face with Bono and the Edge of U2. Mike and Mark Farley, '84, are consulting for a multimedia software company in the Bay Area. They had the opportunity to do a product demo for the band that led Bono to remark, "Intelligent and cool." For their efforts, Mike and Mark were invited to attend the concert at the Oakland Coliseum and received back-stage passes.

Look forward to seeing you all at our 10th Reunion.—**Jonathan Goldstein**, secretary, c/o TA Associates, 45 Milk St., Boston, MA 02109

84

Jacqueline Brenner is a member of the technical staff at Texas Instruments in Waltham specializing in digital signal processing. . . . **Charles Oppenheimer** completed a PhD in mechanical engineering at MIT and is now working at Noise Cancellation Technologies in Maryland with his wife Lillian Hill, '83. . . . **John Nielsen** is in Texas as a meteorology professor at Texas A&M University. John is engaged to be married to Beth Gammon, a local attorney, in May. . . . **Ben Strowbridge** is currently a postdoctoral fellow in the Department of Physiology and Biophysics at the University of Washington.

Audrey Dow finished graduate school and is now back in high school. She teaches chemistry and physics at Westford Academy in Westford, Mass. Teaching is challenging, frustrating, and enjoyable. She told her students about smoots when she taught measurement and the metric system and she thinks that has helped some of her students decide to apply to MIT. . . . **Heide (Stefanyshyn) Piper** left sunny Hawaii for sunny Virginia Beach last year with her husband Glenn, SM '85, and 3-year-old son Michael. She is still on active duty in the Navy and is stationed at Commander, Naval Surface Force, U.S. Atlantic Fleet Staff. . . . **David MacKay** is now stationed at LA-AFB as team chief for the Mobile Ground System of the Defense Support Program. He is happily married for the past year to Lee. David hopes to start a master's degree and a family next year, and you will all see him at our 10th Reunion.

David Gerber is serving in the U.S. Air Force as an F-15 instructor pilot at Tyndall AFB, Fla. Dave and his wife are expecting their second child in July. . . . **Luis Torres** is working as an ER physician with the U.S. Army at Gorgas Army Hospital in Panama. . . . **James Mihori** moved down to Washington after graduation to work at the RAND Corp. as a defense analyst. He started graduate studies at Johns Hopkins School of Advanced International Studies in 1986 and received a master's in international relations in 1988. James married Margaret Parker (a fellow SAIS grad) in 1990, and they spent the last two years in Tokyo where James was doing research for an SAIS PhD dissertation on Japanese

security. They are now back in Washington where James is finishing up his dissertation.

Stuart Gitlow is moving back to Cambridge to start his first real job, as an instructor in psychiatry at MGH. Stuart apologizes for it being Harvard but promises to be the first in line when MIT becomes affiliated with a hospital.

Paul Dietz is finishing up a PhD in electrical engineering at CMU. Paul says that—other than getting married, buying a house and moving to the 'burbs, and expecting their first child in March—this has been a completely uneventful year. . . . **Paula Hammond** is a graduate student in chemical engineering at MIT working in a polymer physics group and she has been selected to hold a Ford Foundation doctoral dissertation fellowship for 1992-93. . . . **Hauke Kite-Powell** was recently promoted to research associate at the Woods Hole Oceanographic Institution and is going to settle in Falmouth and "expand the wolf pack."

Eric Fleming is a program finance analyst at ESPN in Bristol, Conn. Before working at ESPN he was an assistant director for varsity sports at Yale. . . .

Kjirste Carlson is the "fastest woman on water" having set a new women's speed mark for human-powered watercraft. Kjirste pedaled the *Decavitator* hydrofoil at 16 MPH over a 100-meter course. She is also a member of the MIT cycling team. Kjirste is a graduate student in mechanical engineering in the Newman Lab for Biomechanics and Human Rehabilitation.

Ken Grant sent a long e-mail to say: "My wife (Ginny Ryan Grant, Wellesley '85) and I recently took eight months off from work to travel around the world. We went to Ayers Rock, Borobodor, Sukhothai, the Taj Mahal, the Ellora caves, the Pyramids, and Stonehenge. We ran white water in New Zealand, Australia, and Nepal. We hiked on both islands in New Zealand, in the Golden Triangle, in the Annapurna region of Nepal, and in England's Lake District. We met Dani tribesmen in Irian Jaya, Penan guys with blowpipes in Borneo, all kinds of Thai hill tribes. We went caving in Tasmania and in Borneo. We went game watching in Kenya and Nepal. We went scuba diving in Fiji and on the Great Barrier Reef. We drank Singapore Slings in the Long Bar at Raffle's, champagne at the Dukes Hotel, and Real Ale all over the Lake District. We had a total absolute mind-bending blast—55 plane flights, 46 different airports, 14 countries, five continents, at least 1,800 frames of film, 10 courses of antibiotics, one course of amebicide, and one broken finger. One Communist uprising coupled with martial law, rioting and deaths (we walked to the airport since taxis wouldn't run). Travel by train, bus, boat, car, camel, elephant, rickshaw, motor scooter, even a Chinese dump truck full of gravel. Accommodations ranging from sleeping on the ground to maharajahs' palaces—four months without drinking tap water. In the last three years we've also gone hiking in France, Switzerland, Scotland, and Kauai, and taken vacations in England and Mexico. After all this excitement we're planning on staying home for a while (well, at least until I can talk Ginny into the next trip)." —**Howard Reubenstein**, secretary, 28 Mitchell Grant Way, Bedford, MA 01730, (617) 275-0213 (home), hbr@mitre.org

85

Please send news for this column to: Bill Messner, secretary, 8 West Winkley St., Amesbury, MA 01913, (508) 388-3872, messner@cmls6.berkeley.edu

86

Happy New Year and hello from Washington, D.C. I've given up my beach house and relocated to the suburbs of northern Virginia. We (Erik and I) bought our first house (a colonial) and a new Ford

Explorer. Now it's to cool the spending for a while. Sorry about the short column last month but I was between houses and didn't have all my *Review* stuff with me.

Chris Kim sent his season's greetings from Pittsburgh. He is in the middle of his second year of an internal medicine residency at the University of Pittsburgh. He got married last June to Jane Lee (Wellesley '86) outside of Baltimore with a relaxing honeymoon in Switzerland. . . . **Evie Vance** quit work at the Center for Naval Analyses in 1990 to pursue a PhD at the University of Maryland (with research in space robotics). She plans to complete it sometime in 1994. She and her husband Dan (PhD '88) had a baby boy last summer—Cameron Robert Heimerdinger. Evie passed on some news about other alums. . . . **Lee Fortunato** got married in October. She should be getting her PhD from UC/San Diego soon. . . . **Annabelle Kim** lives in Edison, N.J., and works for an engineering consulting firm. . . . **Caroline Wang** works for Johnson & Johnson in the Boston area. . . . **Jennifer Snopkowski** works for Hughes Radar Systems in El Segundo, Calif.

Sean Manns has been working in sales and marketing since 1986. In May 1991, he married Jennifer Rinehart. He is currently attending Wharton full time to get an MBA and searching for that one great idea to found a company on. . . . **Tom Kurfess** is still an assistant professor at Carnegie Mellon in the Department of Mechanical Engineering, and Engineering and Public Policy. He is also a house master for CMU's newest dormitory. Tom was recently awarded a 1992 National Science Foundation Young Investigator Award, which finances research of faculty near the beginnings of their careers. Tom and his wife Adriana, '87, spent the summer at the Lawrence Livermore National Lab working in the Precision Engineering Program. They worked on several projects including a large scale adaptive optics system that may be used to beam power to orbiting satellites or a lunar base. As a result of this work, Tom was appointed a participating guest and will continue to conduct research at LLNL. While in California, Tom met **Chris Raanes** and his wife, Melanie Mauldine, '85, and **Sanjay Govindjee**. Several MITers are now starting up at CMU: Jean Moroney, '85, is pursuing a PhD in psychology; Bill Messner, '85, is joining the mechanical engineering department faculty in January.

Jose Vasconcelos-Sousa wrote in from the EEC. He is living in Portugal where they have California-like sun 90 percent of the time. He has been assisting investors from all over who are interested in Portugal. The local MIT club was started last year and their first event was a talk by Sloan Professor Arnoldo Hax. It was a big success with the local business community and media. Jose invites all MIT alumni who visit Portugal for pleasure or business—don't hesitate to give him a call. . . . **Stu Schmill** has been the director of crew at MIT for the last few years. . . . **Lieutenant Renton Carsley** (U.S. Navy) recently deployed with Fighter Squadron 32 to the Mediterranean with the USS *JFK* aircraft carrier battle group. Renton will participate in numerous exercises designed to challenge the mission readiness of the ship and crew. . . .

Harish Sangani had a son born on October 17. . . . **Yona Kaplan** bought a house in Troy, Mich., and is getting married to Jim Forbes in the spring of 1993. . . . **Pace Willisson** is still consulting and is now also working for BSDI; in both cases, he works at home on his UNIX systems. . . . **Richard Herrmann** survived another Chevron reorganization last summer—they lost about 30 percent of their earth scientists. He's still in Bakersfield, Calif., but would rather be remastering old Grateful Dead tapes to CD format. He's getting married this summer to Lynelle Bautista (Stanford '87). The best man will be **Richard Sleischnr**. . . . **Walter Santarelli** was married to Ellen Marie Delaney (Seattle University '86) on May 23, 1992, at St. Joseph's Roman Catholic Church. He's still working at Boeing performing safety analyses and certification work on the 777 autopilot system. . . . **Steven Kroft** is in his second year of pathology

residency at Northwestern Memorial Hospital in Chicago.

John Swartz bought his first home last April in Winchester, Mass. He's having lots of fun learning how to demolish and rebuild closets, stain furniture, and flood a basement. He also received a master's in electrical engineering at UMass/Lowell last February. . . . **David Sperry**, Alan Huba, '69, and **Marilyn Oberhardt** were involved with the Tethered Satellite System carried aboard the Shuttle Atlantis in August. "Although the satellite deployer malfunctioned, our experiment worked well and returned a significant amount of interesting data about plasma and beam interactions in the Shuttle environment." . . . **Dan Kulp** just completed a PhD at the University of Pennsylvania. He is presently at Brandeis University conducting postdoctoral research in biophysical chemistry.

Thanks for the news! Note the new address.—**Mary C. Engebret**, secretary, 21305 Arrowhead Ct., Ashburn, VA 22011, (703) 729-6568

87

Michael W. Schimpf reports that he is living in Virginia Beach, Va., and flying F-14s for the U.S. Navy. He regularly sees **Chuck Chase** and his wife, Andrea, as well as **Dave Easterby** and his fiancée, Rebecca Webb. . . . **Elizabeth Parker** is now teaching chemistry and physics at New Trier High School in Winnetka, Ill. She writes, "I'm in my first year of teaching, and it is much harder and more stressful than my four years as an engineer! But it is very rewarding and I'm glad that I made the switch." . . . **Bob Vokes** finds that he's currently living a "schizophrenic life" while working for A. T. Kearney, splitting his time between London and New York while still trying to lead a life in Boston. (It sounds more exciting than schizophrenic to me!)

Kenneth Gartner fills us in on what he's been doing for the past five years. "After graduation, I worked at Prime Computer in Framingham designing minicomputers. I left before its eventual demise and now work for the American subsidiary of Hitachi, where I am a UNIX kernel engineer on an IBM mainframe platform." Ken is married, lives in Waltham, and has two children ages 2 and 4. . . . **Patrice Hornsby Allen** was married December 28, 1991, at the West Point Cadet Chapel. Her husband is an assistant professor of civil engineering at West Point. Patrice works at the Albert Einstein College of Medicine as a research coordinator. . . . **Stacey Katchman** was married to Paul Horenstein, an orthopedic surgery resident, this past November. She is currently a NIH research fellow in molecular dermatology at Jefferson Hospital in Philadelphia, Pa. After her stint at the NIH, Stacey plans to resume her clinical training as a dermatology resident.

Nike V. Agman reports: "My husband, Chad Nelson (Caltech '87) and I spent Halloween with **Jenny Gleason**, who is currently in her fourth year in the PhD program in biology here at Yale. My life is going great, and I can't believe that Chad and I will be celebrating our third anniversary in February (1993). I'm into my second year in Slavic linguistics at Yale and enjoying it immensely. Chad and I would also like to wish **Liana Alvarez** best of luck in her new life as a grad student at the 'Tute." . . . **Neal Hoyer** writes: "The summer flew by, but not before seeing numerous Reds games, brass concert performances, a wet canoe trip, and seeing **Adam Kane** in New Jersey." Neal recently bought a house in Cincinnati and had the requisite housewarming party this past September.

That's all that I have for now. I will be contacting a few of you each month to drum up more news for this column. So don't be surprised if at some point you find me on your answering machine or in your mailbox. Meanwhile, have a great spring!—**Jack Leifer**, secretary, 2703 Swisher St. #202 Austin, TX 78705, (512) 472-7507, email: leifer@ccwf.cc.utexas.edu

88

5th Reunion

Reunion Update: The Class of '88 Reunion is only a few months away! We now have over 25 people involved in either the Reunion or Reunion Gift Committees! Our Reunion Committee is now being cochaired by **Jocelyn Koehler** and **Sheila Neville**, who have been busy planning exciting events and have recruited an enthusiastic committee to help out. Committee members include **Jim Casamento**, **Sharon Els**, **Erik Heels**, **Suzanne Maggioni**, **Abgon Ruiz**, **Kimber Lynn Zinger**, **Carla Kapikian**, **Lon Shunshine**, **Reggie Tucker**, and **Cathy Singer**. Jim Casamento, our nominations chair, is organizing nominations for class officers and preparing for elections that will take place at the reunion (details were included in the fall mailing).

By now you should have received at least two letters/cards about reunion and reunion gift activities. If MIT does not have your current address and preferred class affiliation, you can notify the Records office. Also, Erik Heels has offered to send reunion news through e-mail. If interested, the Records office can add your e-mail address. We wouldn't want you to miss out on any exciting news! Our Reunion Gift Committee has been doing a great job in working toward meeting our Class of '88 Gift goals. Much thanks to those who have donated! If you haven't, there's still time! You may want to designate your gift to the Class of '88 Scholarship Fund, which is already partially supporting students! Also, donations over \$100 will receive a handsome barrel bag, and all donors will receive a Class of '88 decal. So don't miss your chance! And stay tuned for future reunion updates!

Now on to some class news. . . . **Curt and Karen (Krans) Cooprier** are living in Seattle and working for Boeing. New addition to the family is Nicole, born November 1, 1991. They attended the wedding of **Edward and Audrey (Ching) Nakamoto** in Honolulu in June 1991. Also attending were **Matt Kelley**, and **Kristen and Andy Keith**, and **Jacob Wohlstadtler**, '90. I guess congratulations are due all the way around!

Juan Cornejo graduated from Boalt Hall School of Law at UC/Berkeley in May 1992. He will be working for a law firm in Sacramento. . . . **William Bayer** is still working in the Cellular Group at Motorola in Arlington Heights, Va., and recently bought a townhouse near work. He has a nice garage. . . . now if he only had a car to put in it. . . . **Huang Choi** completed his first year of business school at UCLA and spent the summer interning for Procter and Gamble in Korea.

Pedra Huang got married on August 18, 1991. . . . More wedding news (although the January '93 issue already beat me with a wedding photo.): **Debbie Lee** and **Javier Tam** were married in July 1992 in Austin, Tex. There were many MIT alumni in attendance, including **Darlene Flores (Dewilde)**, **Carlos Flores**, '87, **Phil Sanchez**, '87, **Diane DiMassa**, **Mike Mills**, '89, **George Deltas**, **Wilson Wong**, '87, **John Ma**, '90, **Min Tung**, '90, and **Veronique Stassen**, '89. **Debbie** and **Javier** reported they had a wonderful honeymoon in Hawaii (just missing the hurricane). **Debbie** finished an MBA at Texas A&M and **Javier** is working for IBM. Congratulations!

Diane DiMassa is working on a PhD in ocean engineering at MIT and is having fun chasing minisubmarines in the Charles. You may have seen her on CNN explaining her research! . . . **George Deltas** is working on a PhD in economics at Yale. . . . **Carlos** and **Darlene Flores** are now living in Arizona. **Darlene** is working for Motorola in Phoenix.

Tupper Hyde is back at MIT working on a PhD in aero/astro after a two-year stint as an artillery officer in Ft. Sill, Okla. He and his wife, **Laura Highstone Hyde (Wellesley)**, '88, have a son, "J.T.," born November 1991. . . . **Aimee Smrz** got married May 31, 1992, in the MIT Chapel. Her husband, **Jonathan Burstein**, finished Harvard Med School in June. They live in Stonybrook, N.Y., where his residency is. Her bridesmaids were **Maddalena Coppi** and **Lori Tsuruda**, '89. **Maddy** is a grad student in

biology at Harvard. **Aimee** worked as a psychiatric counselor for four years in an outpatient treatment facility and in an inpatient unit at Cambridge Hospital. She plans to apply to graduate programs in clinical psychology in New York. . . . **Arleen**

Shames was also wedding planning around the same time, as well as trying to finish up at Wharton and job hunt in the Big Apple.

Christopher Cook was overseas for five months with UP-26 flying the P-3 Orion. He returned in November and had his second child in January 1993. . . . **Michael Gaidis** and his wife, **Denise**, had their first child, **Erin Jordoin Gaidis**, on June 30, 1992. . . . **John Seo** received a PhD from Harvard in June 1991 and married **Stella Cho**. They already have two sons, **Phillip** and **Alexander**, with another baby due this spring. Congrats!

Arlene Marge recently took a leave of absence from a PhD program. She is currently working as an energy management consultant. She is excited about taking part in the conservation of natural resources. . . . **Andrew Miklich** is attending graduate school in physics at the University of California, Berkeley. He is studying superconductivity and expects to graduate in May 1994. . . . **Carla Kapikian** will be graduating from Harvard Business School in June 1993 (as will **Matthew Chorian**). **Carla** spent the summer in London at P&O, the largest United Kingdom shipping company. She is still enjoying Boston.

Anthony Curtis is a PhD candidate in electrical engineering at the University of Illinois. He received a master's in electrical engineering from Princeton and a master's in physics from the University of Illinois. He is rooming with **Scott Lordi**, '89. That's quite an impressive array of credentials!

. . . Speaking of impressive, **Douglas Henkin** graduated with honors from the University of Pennsylvania Law School, where he was publishing editor of the *Law Review*. He is now clerking for the senior judge of the U.S. Court of Appeals for the Tenth Circuit. . . . **Lynn Hazan** is finishing up her last year at Wharton Business School. Then it's off to Los Angeles to work in the music industry. She attended **Eddie Forzani** and **Aneke VanMark's** wedding and saw her old New York City roommate **Joe DiSabato** and other Sig Eps. **Joe** is at UCLA Business School, and **Eddie** and **Aneke** are going back to Japan.

Mike Garrison works for Boeing Noise Engineering. . . . **Jim Harrison** was recently made VP of Global Networking Strategies for META Group, an industry analysis/market research/consulting firm focused on information technology. He is happy to be back in Virginia, where he often sees MIT alumni. . . . **Jorge Samayoa** is currently employed by Xerox Corp. as a mechanical design engineer.

Now a little bit of medical stuff (you knew it was coming). . . . **Mike Couris** is interning at Balboa Navy Hospital, San Diego. He has a condo on the beach (doesn't everyone in San Diego? Must be rough!) After one year he wants to become a flight surgeon. . . . **Julie Levine Friedman** is doing her residency in pathology in Miami and has been enjoying the first few months of her marriage. . . . **Hey Jin Kong** is doing her internship in internal medicine at Boston City Hospital. She finds it tough, but enjoyable (really?).

Christine McIntyre is doing her residency in pediatrics at the University of Chicago (right?). . . . Do you ever see **Mike Teng**, who received a PhD in biology? . . . **Chen Tung** is doing his residency at Duke in internal medicine. . . . **Joe Woo** is doing general surgery at the University of Pennsylvania. . . . **Lawrence Rosen** is graduating from med school in June 1993 and pursuing a career in pediatrics in the New York City area. He will be getting married in May 1993 and pursuing a career in pediatrics in the New York City area. He will be getting married in May 1993 to **Laura Epstein (Haverford)**, '88. **Lawrence** recently spoke to **Mark Shudd** and the rest of Delta Kappa Epsilon class of '88 regarding our 5th Reunion. Hope to see everyone there!

David Saslav is wondering how to get in touch with **Kim Stopak**. Any clues? . . . **Mike Frey** is working for Hewlett-Packard in Sacramento. He spends his free time hang gliding at Tahoe. . . .

Chris Saito is out on a six-month cruise, destination confidential. He ran into **Jeff Hwang** at the Officer's Club in the Philippines last year by accident (small world!). He's flying F-15s for the Air Force in Japan.

Steven Cohen married **Merle Bloostein (Simmons)**, '88 on June 21, 1992. Among those attending were **Mark Terualok** and **Terry Wong**. . . . **Michael Katz** married **Sandra Aresta (Mount Holyoke)**, '88 in August 1991. They met freshman year in college and have since lived in Bologna, Italy, but are now in D.C. . . . **Gail Sadlo** was transferred to Boeing, Philadelphia, from Boeing, Seattle, last January to "escape the rain and eternal gloom" in Seattle. She is still working on the new 777. **Paul Anderson** stopped by for a visit last February, they started dating, and he proposed in May. The wedding is planned for April 3, 1993! . . . **Aida E. Ayala** is doing waste management for DuPont outside of Houston. She is also engaged. Congrats to one and all!

Joseph Nardone writes about what he's been up to since graduation. After a short stint at Whitehead, he formed his own homemade ice cream shop in Burlington, Mass., called Scoops Ice Cream. He has since opened two other shops. Unique to his chain is that they make deliveries much like Domino's. He also has a new business venture in the works that involves popcorn. . . . stay tuned! In September 1991 he bought a houseboat on which he lives at Commercial Wharf in downtown Boston (thanks for the photo!). Good luck to you in the business world!

Keiko (Kay) Chevray (formerly Kay Yamaguchi) writes about San Francisco Bay area alumni. First off, she was married to **Pierre Chevray**, '87, in June 1992 in New York. There were many MITers at the wedding, including **Sean Banchik**, who is working in the Los Angeles area; **Minor Huffman**, who is working in New York City; and **Craig Wanke**, who is finishing up a PhD at MIT. **Craig** is officially engaged to **Claudia Raniger**, '89. **Kay** is working at Space Systems/Loral in Palo Alto, Calif., as a controls engineer, while her husband is working on an MD/PhD at Johns Hopkins. They are keeping a long-distance relationship for now. . . . **Al Tadros** works in Kay's department at Space Systems/Loral. He's very much into wind surfing and wants to move to a place where he can wind surf everyday.

Don Hejna sent an e-mail describing his current state: "I'm still in California, at Sun Microsystems, building the next workstation. Things are going well, but I am not running the company. . . . yet. I can't decide whether my next career move will be to stand-up comedy or back to MIT for a PhD (the two can be strikingly similar at times). Starting my own company also has lots of appeal. Alumni are like empty Bud cans out here—no matter where you go you are never far from one. I run into them all the time, which is usually more pleasant than discovering an empty Bud can."

Craig Cohen is pursuing an MBA at Stanford. He sees fellow TDC'er **Jim Bevilacqua** as well as MIT classmates **Peggy Chang**, **Ariel Porter**, **Tim Mattox**, **Rich Davidian**, **Mike Adelberg**, and **Andrea Wong**. He finds business school a refreshing change from engineering. . . . **Raghu Krishnaiah** recently moved to Philadelphia to attend Wharton. . . . **Ricardo Zemela** is working on a degree at Stanford.

John Snyder is also in the Bay Area, and he writes: "Been married now for almost one and a half years. Loving it. TJ (his wife, '89) is working on a PhD at Berkeley in robotics and the same for me at Stanford in microelectronics. Don't know what we'll do after graduation, but chances are we'll end up in Japan eventually. We both get nostalgic about the 'Tute every once in a while. Those were great years. The snowy river scenes. . . walking into Boston. . . the North End. . . . And on that note, this issue comes to an end."

This definitely wins the prize for longest column. Sounds like many of you are getting excited about the reunion. Hope to see you all there, and thanks to all who wrote!—**Grace Ma**, secretary, 155 East 29th St., #32H, New York, NY 10016, (212) 447-1925

There is not much news this month, so please write and send in pictures for our calendar! Here are this month's list of people we want to hear from: **Steve Douglas**, **Rachel Klein**, **Randy Nichols**, and **Jeff Traub**. What are y'all up to? If anyone knows about any of these people or anyone else, please write!

Leslie Liu received a master's degree in applied physics in 1990 and is now married to Ling Yi Lie, '85, who is currently a visiting researcher at Sony in Tokyo. . . . **Elliot Schwartz** is currently working on a PhD in materials engineering at MIT. Elliot is finishing his second year as a floor tutor on 3rd East in Next House and working on an experiment that NASA will be flying as part of the 2nd International Microgravity Laboratory. In December, Elliot was in Cologne, Germany, to attend crew training with his experiment. . . . **Michael Berube** is currently living in Birmingham, Mich., and is working for the Chrysler Corp. Mike is an environmental planning specialist and is working on an energy and alternative fuel vehicle strategy.

David Campbell Jr. finished a three-month deployment to Europe last November. David was with the Seal Delivery Vehicle Team Two and also was promoted to lieutenant, USN. . . . **Mark Moss** sends some e-mail from Okinawa, Japan, to say that things are going well. Mark is still a detachment commander in Army Space Command, playing volleyball, and is working on his tan. Mark reports that there is no real chance for him to end up in Somalia, since his unit is very much a "fixed site" facility. However, his unit may support some of the satellite communications for the units that will deploy there.

That's all the news there is this month, so please write and send pictures!—**Henry Houh**, secretary, 4 Ames St., Cambridge, MA 02142, (617) 225-6680, e-mail: tripleh@athena.mit.edu or henry_houh@mit.edu

90

From the looks of the letters I've been receiving, it seems 1993 will be a year of change and new beginnings for many of us.

Chris Lamb recently quit his job in Houston and moved to Raleigh for graduate school in electrical engineering at North Carolina State University. He and his wife, Robin, spent 24 eventful hours driving a huge truck and towing car to get there. The truck ended up having some transmission problems and Chris had to drive 45 mph through 60+ mph traffic all the way through Alabama, Georgia, and South Carolina. Within 24 hours after arriving to their new apartment, Robin landed a job teaching math and science to sixth graders!

In June 1992, **Peggy Liu** left McKinsey & Co. to work as the third-party marketing programs manager for Symantec in California. She is working on creating an OEM channel infrastructure within the company. She spends most of her time coordinating projects, making sales calls, and creating marketing plans.

Jigna Desai writes that after spending two years in San Francisco, she is now in Minneapolis attending graduate school in English and women's studies. She assures us, though, that she has not abandoned astronomy; she is just taking a break after she and her Berkeley colleagues discovered the most distant supernova yet observed! This past spring, Jigna vacationed in the Canary Islands and Spain, in addition to visiting Paris, Amsterdam, and Barcelona with **Marie Coppola** and **Nathan Yang**, '87. The most exciting news from Jigna is that she is engaged to **David Bael**, '88. Congratulations!

Yvonne Grierson has also just moved to Minneapolis. After graduating with a master's in mechanical engineering from MIT in June 1992, Yvonne vacationed all summer before starting work for 3M in St. Paul as an advanced mechanical product development engineer in the Hardgoods

and Electronic Support Division. Also at 3M are **Christine Gundal**, **Charles Graves**, **John Allen**, '89, and **Tony Webber**, '91.

Honor Jones-Passow writes that she and **Christian Passow** were married the weekend right after our commencement. For the past two years, Honor and Christian have lived at Eastgate while they both worked on master's degrees in mechanical engineering at MIT. They have now both received their degrees. MIT is currently applying for a patent on technology that Christian developed during this thesis research. Christian has begun working in Batavia, Ill., at Furnas Electric Co., which makes electric motor starters and controllers. Honor has been working for her high-school teaching certificate so she can pursue her goal of teaching math and science. It hasn't been all work for Honor and Christian, though. Before settling down in Batavia, they traveled to England, California, and Washington to visit friends and relatives.

Patrick M. Haluptzok is working for Microsoft in Redmond, Wash., developing the operating system Windows NT. . . . **Elizabeth Earhart** is in graduate school in Course III at MIT. She is still heavily involved in ballroom dancing. In fact, in April she and Warren Dew, '81, won the New England Amateur Smooth Championships, and in August they placed second at the National Championships.

Please send news to—**Ning Peng**, secretary, 305 Memorial Dr., Cambridge, MA 02139, or ning@athena.mit.edu.

91

"It's great to hear how people are doing!" writes **Andy Parsons**, who is working for a biotech company, Millipore, in Bedford, Mass. Andy hopes to begin graduate studies in biology in a few years, but he is now keeping very busy with road, bike, and rollerblade races, as well as biathlons and triathlons. Andy lives with several classmates in a Somerville house they call "Beta Phi Delta." They have house jobs and even house meetings! Andy is thrilled to be able to live the college lifestyle without the college workload. He sends us news about other BFD brothers. . . . **Bob Bellis** completed a master's in mechanical engineering and began his ROTC commitment in Washington, D.C., in January. . . . **Tim Hazen** will begin PhD work after completing a Course VI master's in speech recognition. . . . **Will Gorgen** will complete a master's this spring in Course XVI, working on a windsurfing fin project. According to Andy, Will has plans to finish his thesis and then "hang in Aruba until I can find a job." Andy also sends news about other Theta Xi's. . . . **Jim Weaver** is busy doing his first year of physics graduate work at the University of Maryland. "He's loving every minute of it," writes Andy. . . . **Jeff Everham** is working for Boeing in Philadelphia, after recently attaining a Course XVI master's.

News about several classmates arrives from **Humphrey Chen**, '90. **Lisa Lee**, **Caroline Wen**, and **Sophia Yee** visited Humphrey's Chicago apartment over Halloween weekend. Lisa is in medical school in Ohio; Caroline is taking classes at the University of Wisconsin; Sophia is working at Morgan Stanley in New York; and Humphrey works at Price Waterhouse. The four bumped into **Enrique Herrera** and **Laurette Gabour** on Chicago's Rush Street. Enrique works in Detroit at Ford, and Laurette is working on a master's at MIT. Caroline, Sophia, and Humphrey found the MIT Club of Chicago "Graceland Cemetery tour" a perfect activity for Halloween day. They saw **Nelson Lin**, PhD '90, who is at Amoco, and the next day met with **Bonnie Kao** for lunch. Bonnie is interning for Motorola in the Leaders for Manufacturing program.

Anne Sammis sent me a copy of a letter she has circulated that opposes a controversial effort to increase the numbers of caribou and moose populations in Alaska. The Alaskan plan calls for killing

a number of wolves in Alaska, and in her letter Anne argues that the effort to kill the wolves is supported by hunters who want more caribou and moose only so that they can hunt more of them. **Lisa (Paradis)** and **Emanuel Berkenbilt** play in the Vienna Community Band in Vienna, Va. Emanuel works for Engineering Research Associates and is currently assigned to a contract for Lincoln Labs. . . . After serving as the auxiliaries officer on board the cruiser USS *Jouett* (CG-29) on patrol in the Persian Gulf, **John Thompson** returned to his home port of San Diego in January. . . . In October, **Jason Slibeck** completed the qualification course for Navy Supply Corps Officers in Athens, Ga.

Michelle Bush is teaching chemistry and biology at MIT in the Experimental Study Group. During the fall, she visited **Erik Anderson** and **Jenn King** at Stanford. "We would like to report that we are having a good time while attempting to achieve Zen," says Michelle. . . . **Heather Crum** sends a postcard of Nauset Light from Cape Cod. Heather spent the year after graduation studying at Wellesley College to get a teaching certification. She is now teaching chemistry at Nauset Regional High School. "This is a very beautiful place to live," writes Heather, noting that December in Nauset is "very quiet and cold."

Tamara Schulman sends a postcard of her favorite doorway in Paris. It's absolutely elaborate. Although I'm sure that Tamara could explain it more pleasingly, I'll just describe the doorway as playfully shaped into a reverse "P." She returned to the States from France during the autumn and writes that she is "recovering in the heat of the South" in Richmond, Va. Tamara mentions that she and **Helene Conway**, SM '91, are entering a Richmond architectural competition.

Let's keep those postcards coming! Please send news to **Andrew Strehle**, secretary, 12 Commonwealth Ct #10, Boston, MA 02135, (617) 232-2261

92

Please send news for this column to: **Leslie Barnett**, secretary, 56 Brown St., Mineola, NY 11501

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I CIVIL AND ENVIRONMENTAL ENGINEERING

From Arlington, Mass., **Kenneth R. Maser**, SM '67, PhD '71, writes: "I founded Infrasense in 1987 while working as a research associate in the Civil Engineering Department. My company is now a leader in the application of highway-speed ground-penetrating radar for pavement and bridge deck evaluation. We have carried out projects in 19 states and have overseas projects in the planning stages." ... **Anthony J. Costanza**, SM '52, of Jupiter, Fla., retired from Costanza Contracting Co. on June 28, 1992. ... **Asaf A. Qazilbash**, SM '65, CE '67, reports: "I'm continuing as president of Asaf A. Qazilbash & Associates, consulting geotechnical engineers. I'm completing my term as a member of the board of directors of the Islamic Center of New England. I'm working on several sections of the central artery project, and the Boston Harbor cleanup." ... **Roy S. Morgan**, SM '80, sends word: "I recently completed a one-year assignment at the Malcolm Baldrige National Quality Award. I'm returning as a computer scientist at Computer Systems Laboratory of the National Institute of Standards and Technology (formerly NBS)." ... **Salvador Miranda Barreda**, SM '82, writes: "I'm working as a senior application designer at the British Columbia Central Credit Union in Vancouver, B.C., one of the best places to live." ... **Daniel P. Kurtz**, MCP '79, reports that he is senior VP at the NYC Economic Development Corp. ... **Frannie F. Humplick**, SM '86, PhD '90, is a transport economist with the World Bank. ... **Shian-chee Wu**, PhD '86, reports: "I have been teaching at the National Taiwan University since 1986. I enjoy research and teaching works and get involved in many government projects."

From Fort Lewis, Wash., **Gregg Martin**, SM '88, SM '88 (TPP), PhD '92, writes: "I graduated from the U.S. Naval War College in June '92 with an MA in national security and strategic studies. I completed the PhD 3 months later in an interdepartmental program with Course I (construction management) and Course XVII (defense studies). I'm currently working as the engineer operations officer of U.S. Joint Task Force Bravo in Honduras. I'm responsible for programming, planning, and managing a U.S. troop construction program in Central America. The primary focus is on humanitarian and civic action projects such as building schools and medical clinics and drilling wells." ... **Drew Persinko**, SM '79, is president of AJP, Inc., a nuclear consulting firm in Gaithersburg, Md. ... **David H. Marks** has been named the first holder of the James Mason Crafts Professorship. Crafts was MIT's turn-of-the-century president. He was an internationally respected scholar who made important contributions to the field of chemical research. He joined the MIT faculty in 1870, but four years later returned to Paris where he had spent many years in research. A few years later he and a colleague discovered what came to be known as the Friedel-Crafts reaction involving aluminum chloride. He returned to MIT in 1891. Marks is director of PEEER, Programs for Environmental Engineering Education and Research, in the School of Engineering. His main area of interest is in how large-scale infrastructure systems are organized and managed with special concern for the anticipation and mitigation of environmental and economic impacts. Much of this work is based on large-scale computer-based simulation and optimization modeling to help illuminate conflicts

between the competing objectives of interest groups and governments.

Army Colonel **Sears Y. Coker**, SM '47, (ret.), of Alexandria, Va., died on May 22, 1992. In WWII, Coker helped in the seizure of the Ludendorff Bridge over the Rhine at Remagen, Germany, an operation that was credited with shortening the war. Coker was engineer officer of the 9th Armored Division when the unit seized the bridge on March 7, 1945, as the retreating Germans were trying to blow it up. An explosion damaged the bridge, but it was still standing. Despite enemy fire, Coker checked it for structural soundness, helped defuse other explosive charges, and directed repairs. It was the only bridge across the Rhine that was captured intact, and allied forces were able to use it for 10 days before it collapsed. By that time, temporary bridges had been put in place. Coker was awarded the Bronze Star with combat "V." In the years following the war, he served in Korea and at various posts in the United States. He was a professor of engineering at West Point and district engineer at Charleston, S.C. He was also stationed in Puerto Rico and Aberdeen, Md. In 1967, Coker retired from the Army and settled in the Washington area. He was an engineer for the Office of Emergency Preparedness and the Federal Power Commission, where he was a member of the International Niagara Working Committee. He retired in 1983 for reasons of health. Coker was also decorated with the Legion of Merit and the Belgian Croix de Guerre. ... The Association of Alumni and Alumnae has been notified that Colonel **Ellery W. Niles**, SM '38, of Albuquerque, N.M., died on July 11, 1992. No further information was provided.

II MECHANICAL ENGINEERING

Lewis R. Grigg, SM '90, SM '90 (XIII), NE '90, writes: "I am working for the supervisor of shipbuilding, conversion, and repair in Pascagoula, Miss., as ship superintendent for the amphibious assault ship Kearsarge (LHD-3), under contract at Ingalls Shipbuilding. Kearsarge is scheduled to deliver in May '93." ... From New York City, **Lawrence H. Linden**, SM '70, PhD '76, writes: "I joined Goldman Sachs & Co. in March 1992, and was elected a partner in October. I am responsible for the firm's risk management systems. Before joining Goldman Sachs, I was a partner in the New York office of McKinsey & Co., where Goldman had been one of my major clients." ... At the 1992 International Meeting of the American Society of Agricultural Engineers held in Charlotte, N.C., **Hjalmar D. Bruhn**, SM '37, professor emeritus in the Agricultural Engineering Department at the University of Wisconsin, was awarded the Cyrus Hall McCormick-Jerome Increase Case Gold Medal with the inscription: "for exceptional and meritorious engineering achievement in agriculture." Bruhn was cited for his research in advanced designs for forage harvesting and storage equipment and for designs of tree planting machinery, mechanical cherry harvesting equipment, and well drilling and sprinkler irrigation systems. Other research has covered the dewatering of alfalfa to hasten drying with a nutrient-rich supplement recovered from the expressed liquid. He shares the honor with the many graduate students who worked with him over the years to earn their advanced degrees.

Joseph A. Knapke, SM '88, and **Amy A. Knapke** announce the birth of their first child, **Alison Renee Knapke**, on August 31, 1992. ... From Japan, **Masao Ishihama**, '83 (Center for Advanced Studies), writes: "At Nissan Research Center, I am involved in the development of an active noise/vibration control system for passenger cars. Also playing as a project leader of the 'super lightweight vehicle research project' for better fuel economy and performance." ... **Gary Snively**, SM '85, reports: "I graduated from the University of Michigan with a PhD in mechanical engineering in October 1992." ... **John J. Eige**, SM '55, sends word: "I retired from IBM in 1991. I'm enjoying walking, traveling, computing, and painting. Lucky to have our two daughters and their families also here in San Jose." ... **Lieutenant Mather K. Waltrip**, SM '89 (XXII), SM '89, writes: "I'm finishing up my tour at Mare Island Naval Shipyard. Planning to leave the Navy this year and start a career as a consultant or sales engineer in the San Francisco Bay area." ... **Adrian Bejan**, '71, SM '72, PhD '75, was awarded the title Doctor Honoris Causa by the Bucharest Polytechnic Institute on October 27, 1992. He is currently the



Julia Gates

J.A. Jones Professor of Mechanical Engineering at Duke University. ... **Julia Gates**, SM '84, ME '84, has completed her internship at Malden Hospital and has been appointed a resident physician in the Department of Radiology at the New England Deaconess Hospital, and as a clinical fellow at the Harvard Medical School. Gates has taught courses in the physical and biological sciences as well as in mathematics. She is the recipient of several fellowships and has been elected to both engineering and medical honor societies.

C. Lawrence Meador, SM '72 (XV), SM '72, sends word from Wayland, Mass.: "I was elected to the American Society for Macro-Engineering board of directors in October 1992. I started a consulting and system development firm named Management Support Technology in February 1992. Sales exceeded \$1,000,000 within nine months." As a lecturer in MIT's School of Engineering, Meador is well known as an important contributor at MIT to the development of the field of Decision Support Systems (DSS), computer-based applications used to improve organizational effectiveness and performance of senior managers and policy makers. His consulting and research have focused on how organizations should use advanced information technology to dramatically improve organizational effectiveness, productivity, quality, flexibility, and speed. ... **John S. Troiani**, '78, was recently elected to fellowship in the American Academy of Pediatrics. To qualify as a Fellow of the Academy, a pediatrician must be certified as a fully qualified specialist in the field of child health. Troiani lives and practices in Marquette, Mich. ... **Jeffrey Horowitz**, SM '68, ME '68, ScD '72, president of DuPage Computer Applications, Inc., in Woodridge, Ill.; **Said Jahanmir**, SM '73, PhD '77, head of the Tribology Group at the National Institute of Standards Technology in Gaithersburg, Md.; **John J. McGrath**, SM '74, PhD '77, professor

of engineering at Michigan State University; and **John Moore**, SM '67, ScD '69, professor of mechanical engineering at Virginia Polytechnic Institute and State University, have been named Fellows of the American Society of Mechanical Engineers. The Fellow grade is conferred upon a member with at least 10 years active engineering practice who has made significant contributions to the field.

Mark J. Jakiela, Course II professor, has been named one of the first two holders of the Robert N. Noyce, PhD '53 (VIII), Career Development Professorship for a two-year term. Jakiela joined MIT in 1988 as assistant professor. His research interests are computer-aided design and automated assembly. . . . **Thomas B. Sheridan**, ScD '59, professor of engineering and applied psychology in Course II, has received the Human Factors Society's 1992 Best Bulletin Article Award. It is given each year for the outstanding technical article published in the organization's monthly newsletter. In the article, "New Realities of Human Factors," Sheridan asks whether the profession of human factors is equipping itself to deal with the immense sociotechnical problems it faces. He cites several areas in which human-factors contributions have been lacking, such as the environment (in order to reduce energy use and pollution) and the justice system (to help the judicial and penal systems operate more efficiently). Other areas requiring human-factors intervention, he writes, are health-care systems, basic education, and air and ground transportation. Sheridan is the immediate past president of the Human Factors Society, whose members include psychologists, designers, and scientists with a common interest in designing systems and equipment that are safe and effective for the people who operate and maintain them.

Lallit Anand, Course II associate professor, has been chosen to receive the first Eric Reissner Medal awarded by the International Conference on Computational Engineering Science. He was selected in recognition of his "outstanding contributions to the computational and experimental mechanics of materials in the past decade." The medal honors Reissner, PhD '38 (XVIII), a noted mechanician who taught at MIT for 30 years from 1939-69 before joining the faculty at the University of California at San Diego, where he is currently professor emeritus of applied mechanics. . . .

Stanley Backer, '41 (XV), SM '48, ScD '53, Course II professor emeritus and senior lecturer, has been named the first winner of a prestigious new award, the Carothers Medal, given by The Textile Institute. Established this year with the help of funding from Du Pont de Nemours, Inc., the medal honors the memory of Wallace H. Carothers, who discovered nylon while working for the company in 1937. The discovery is said to have laid the scientific foundations for the many synthetic polymer fibers of today. The medal will be conferred from time to time in recognition of creativity in the production or use of fibers. The Textile Institute said of Backer's research, teaching, and nearly 40 years as a consultant for Du Pont: "Starting from the engineer's viewpoint with a special emphasis on performance characteristics, his important research included seminal work on false twist texturing, on the mechanics of yarns and fabrics, on the structure and durability of marine ropes, and on the utilization of synthetic fibers in the reinforcement of concrete. He was also instrumental in the formulation and production of the *Thesaurus of Textile Terms* in eight European languages and Japanese."

Harold M. Coverdale, SM '47, of Laguna Hills, Calif., died on September 28, 1992. Although he was born in Milton, Mass., Coverdale joined the Royal Canadian Navy as a lieutenant upon completion of undergraduate school, and was transferred to England on loan to the Royal Naval Fleet Air Arm. After the war he returned to Halifax, N.S., where he married Joan Woodbury in 1945. He later worked for Canadair in Montreal, Canada. He then attended MIT where he was a George Eastman Fellow. Coverdale worked with McDonnell Douglas in the Aircraft Division and was head of industrial engineering until he retired in 1977. He actively supported research concerning Parkinson's Disease.

III MATERIALS SCIENCE AND ENGINEERING

Joseph M. Wells, ScD '70, writes: "I'm remarried—to Ann B. Wells—and living in Natick, Mass. I'm employed by the U.S. Army Research Laboratory in Watertown. I'm serving as executive secretary of Joint Directors of Laboratories Technical Panel for Advanced Materials." . . . **Suphi Yavasca**, SM '44, reports: "After four years in the service of Turkish (mostly government) industrial concerns (13 years of which as VP and USA representative of Eregli Iron & Steel Works with Koppers Co. and U.S. Steel Engineers & Consultants in Pittsburgh), I retired in August 1985. Since then I have been trying to promote business relations between Turkish and U.S. industrial operations." . . . From Shelby Township, Mich., **Paul Tremblay**, SM '83, writes: "I changed jobs and am now with Phillips Petroleum as a market development engineer for automotive plastics."

The Department of the Navy informs us that Navy Lieutenant Commander **Daniel J. Peters**, SM '89, NE '89 (XIII), "has recently deployed aboard the aircraft carrier USS Kitty Hawk, homeported in San Diego on a six-month deployment to the Western Pacific. Peters will participate in a variety of training exercises to increase combat readiness, visit foreign ports, and conduct operations as directed. The Kitty Hawk's mission will follow the Navy's new strategy entitled '...From the Sea,' which shifts the sea services' focus from a global threat to regional challenges and concentrates on near-land warfare and maneuver from the sea. The new direction emphasizes strategic deterrence and defense, forward presence, crisis response, and reconstruction. It will provide the U.S. with naval expeditionary forces operating forward from the sea that are shaped for joint operations and tailored for national needs. The battle group is comprised of three guided missile cruisers, a guided missile frigate, a replenishment ship, and two attack submarines." . . . The American Association for the Advancement of Science (AAAS) has elected **Lionel C. Kimerling**, '65, PhD '69, the Thomas Lord Professor of Materials Science and Engineering at MIT, to the rank of Fellow. Kimerling was cited for "studies of defects in semiconductors and their characterization through deep level spectroscopy."

Linn W. Hobbs has been named the first holder of the John F. Elliott Professorship, honoring the contributions to metallurgical science by the late **John F. Elliott**, ScD '49. For more than 40 years, Elliott, who died April 15, 1991, at the age of 70, was a leader in chemical-process metallurgy and in the specific field of steelmaking. Industries in many countries benefited from his research, and his influence in this field has been multiplied by the work of many students. Hobbs' research is in the area of ceramics and electron microscopy. He is widely recognized as a leading expert on the deleterious effects of electron microscopy on specimens being examined. He used electron microscopy in his research on nuclear materials and high-temperature corrosion as well as in ceramics. Hobbs joined the MIT faculty in 1981. . . . In 1992, for the third year in a row, an MIT faculty member has been awarded the Marion Howe Medal of ASM International, which is the first time this has happened in the 60-year history of the medal. It's also the ninth time the medal has been awarded for work performed at MIT. The winners this year were Course III professor **Thomas W. Eagar**, '72, ScD '75, '88 (XV), and a former student, **Uday Mitra**, SM '82, ScD '84. Eagar is director of the Materials Processing Center and both the Richard P. Simmons Professor of Metallurgy and the Leaders for Manufacturing Professor of Materials Engineering. The Medal is awarded to honor the authors whose paper has been selected as the best of those published in Metallurgical Transactions during the previous year. Last year, **Frank A. McClintock**, '43, SM '43 (II), Course II professor, was the recipient, and the year before, the medal was awarded to **Merton C. Flemings**, '51, SM '52, PhD '54, '78 (XV), and **Andreas Mortensen**, PhD '86, both Course III professors.

The Association of Alumni and Alumnae has been notified of the deaths of **Francis L. Lee**, SM '40, of Whittier, Calif., in February 1985; and **John D. Tyson**, SM '33, of Tarpon Springs, Fla., on July 12, 1989. No further information was provided.

IV ARCHITECTURE

From Dayton, Ohio, **John Sullivan, Jr.**, MAR '38, writes: "I spent last summer in France, where I had a house (small) in the country in or near Carbonet Tarn (district). I spent three months painting, drawing, visiting, and sightseeing. Went to Geneva, Switzerland, to visit friends—then Paris for a week again, visiting. Ended up in the hospital in St. Germain en Lay (emergency) because I thought I was going to have a heart attack—did not. The doctor told me to not drink wine and to watch the rich French food. I am entered in two painting exhibitions here—sold one. I am looking forward to the holidays." . . . **Burton Goldberg**, MCP '60, is a program manager of the Advanced Housing Technology Program at the NAHB Research Center in Upper Marlboro, Md. . . . **Mark Holzbach**, SM '87, sends word: "I enjoy living and working in Japan. It's going on three years now. I share an apartment near Shinjuku (Tokyo's equivalent of New York's Times Square) with friend, Dana Friis-Hansen (former curator of the MIT List Visual Arts Center). We both like it here so much that we don't have plans to return to the U.S.A. in the near term." . . . From Chester, N.J., **Karen Duncan Bonner**, MAR '81, writes: "I am heading up the architecture division at the Bloomfield, N.J., office of TAMS Consultants, Inc., engineers, architects, and planners." . . .

Robert R. Ream, SM '86, reports: "I am a private consultant to foundations and non-profit organizations related to real estate development and management." . . . **Paul D. Sehnert**, SM '88, sends word: "I am a manager at Halcyon Real Estate Advisors in workout and repositioning for real estate. I have a new baby! Joshua David Sehnert was born May 10, 1992." . . . **Sarah Haga**, MAR '89, writes: "**Damon Strub**, MAR '88, and I moved to Atlanta in January of this year. I am working for the Metropolitan Atlanta Olympic Games Authority as a construction project manager. I am enjoying getting to know Atlanta and the South." . . . **James F. P. Wagley**, SM '89, reports: "Sue and I are enjoying life in Dallas and are pleased to announce that on September 18, we had a healthy baby boy named Philip." . . . We hear word from **Donald F. Taylor**, '50, in Toronto, Ontario: "I'm a full-time (almost) volunteer recruiter for the Canadian Executive Service Organization, the Canadian parallel of the International Executive Service Corp. in the U.S. It is a very satisfying experience—offers a great view of the whole world and the ability to see what professional and business men and women can do for Third World and now (in our case) Eastern Europe and Russia." . . . **Susan Myers**, MAR '77, writes: "I have been chief architect for the Public Facilities Department in the City of Boston since 1987, overseeing the renovation and new construction of the 400+ city-owned facilities, e.g., police stations, libraries, schools, etc. I've got special responsibility for the new Boston City Hospital and police headquarters. Project cost for both is \$200 million." . . . **Aron Faegre**, MAR '76, reports: "Aron Faegre & Associates continues work on numerous public works projects, including a 9-1-1 center, a community policing facility, and low-income housing with alums **Paul Ries**, MAR '89, and **Craig Witte**, MAR '90, as members of the design team." . . . **Eugene D. Cizek**, MCP '66, writes: "Sun Oak, a private home and house museum, was featured in *Painted Ladies: America's Resplendent Victorians*. 1025 St. Louis Street—restoration project in the Vieux Lane Historic District was featured as Junior League Showhouse of the Year 1993. I'm still teaching historic preservation courses at the Tulane University School of Architecture." . . . **Avik Roy**, SM '88, writes: "I am working for Akira Yamashita & Asso-

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ciates, Inc., a Boston design and development consulting firm. Our projects are primarily in Japan and the U.S. As urban design manager, I am responsible for project management. We are currently working on coordinating an academic exchange program that has an international group of students (MIT, University of Montreal, University of Chile, and some Japanese students) working on a real project for real clients." ... **Lawrence J. Vale**, SM '88, reports: "My second book *Architecture, Power, and National Identity* was published by Yale University Press in 1992. I remain on the faculty of MIT's Department of Urban Studies and Planning." ... **J. Christopher Kirk**, SM '86, writes: "I was appointed to King County (Wash.) Landmarks Commission. I was also named VP of Dingfield Associates, Ltd., a real estate planning and development firm." ... **Laura Knott**, SM '87, founded the Laura Knott Dance Co. in 1985. The 6-member company recently performed two critically acclaimed theatrical works titled "Curie/Us" and "Biohazard" in Bradford College's Kemper Theater. The company has been described as "darting and dipping across the floor ... like particles in a force field." Knott received a choreographer's fellowship from the National Endowment for the Arts last year. She danced in "Desert Sun/Desert Moon"—a project produced in the Mojave Desert by MIT's Center for Advanced Visual Studies—and performed in an international contemporary art exhibition series titled "technik und medien." ... *On A Human Scale: A Life in City Design* (Fremantle Arts Centre Press, 1992), is a new book by **Gordon Stephenson**, MCP '38, edited by Christina DeMarco. The book jacket states that the book "combines an autobiographical narrative with selections from Stephenson's writings and other documents that give both the specialist and lay reader important insight into his life and works." Stephenson moved with his family to Perth, Western Australia in 1960, after earlier visits in which he prepared the Perth regional plan of 1955. He retired from his post in 1973, but still undertakes private consultancy work and writes on town planning issues.

Robert O. Preusser, former MIT professor of architecture, died on November 16, 1992. Preusser was professor emeritus of visual design in the School of Architecture and Planning. He developed the first studio course at MIT for non-artists, encouraging students to use their scientific and technological studies to create two- and three-dimensional visual forms. A team of his students created the first *Fortune* 500 magazine cover to employ computer-generated design. From 1974 until his retirement in 1985, Preusser was director of education at MIT's Center for Advanced Visual Studies. During WWII, from 1942-45 he served as a camouflage technician with the Army's 84th Engineer Camouflage Battalion in North Africa, France, Italy, and Germany. Preusser was a co-founder of the Contemporary Arts Association in Houston in 1948, and later co-director of the Contemporary Arts Museum. In 1950 Edith Halpert selected him as one of five promising young painters for the Newcomers Gallery in New York Downtown Gallery. In addition *Art in America Review* nominated him as a "Promising New Talent in USA" in 1956. Preusser was invited to MIT by his former teacher, Gyorgy Kepes, now Institute Professor Emeritus. A one-year appointment led to tenure and a 31-year teaching career at the Institute. Preusser's paintings were closely allied with his teaching philosophy of experimentation and innovation. Two exhibits of his works were held in Houston in 1990 and, in 1991, he was honored with a retrospective exhibition of his paintings at the MIT Museum. His works are included in some 200 private and museum collections, as well as in the Archives of American Art at the Smithsonian in Washington, D.C.

The Association of Alumni and Alumnae has been notified of the deaths of **Keith Williams**, MAR '53, of Winchester, Va., on October 22, 1991; and **Gary L. Greeson**, MCP '65, of Ormond Beach, Fla., on June 2, 1991. No further information was provided.

V CHEMISTRY

K.C. Swallow, PhD '78, writes: "After starting my career teaching at Wellesley College and then spending 10 years in industry, I have returned to teaching at Merrimack College with two other MIT alumni! I still consult for MODAR, a small engineering firm developing supercritical water oxidation as a waste destruction technology." ... **James W. Thackeray**, PhD '86, reports: "I am a principal chemist at Shipley Co. where I am engaged in the development of DUV photoresists. My wife and I have been blessed with a boy, who just turned three." ... **John P. Fackler, Jr.**, PhD '60, sends word: "I stepped down from deanship in December 1992 (of the College of Science at Texas A&M). I was the William Manchot Residential Professor at the Tech. University in Munich in 1992 and a Bye Fellow at Robinson College, Cambridge, also in 1992. I'm back now in chemistry at A&M." ... **J. Vincent Fitzgerald**, PhD '43, is board chair and CEO of Nametec Co. in Metuchen, N.J. ... **John Piper**, PhD '60, writes: "In October 1992, I and several other MIT graduates and their spouses toured China on an MIT tour. Great trip—lovely party with MIT alumni in Shanghai." ... Former Du Pont



Bennett Epstein

polymers researcher **Bennett N. Epstein**, PhD '56, was awarded a Charles J. Pedersen Award by the Du Pont Fellows, comprised of 26 scientists who hold this title, the highest level of professional recognition in the company. Epstein invented "Zytel" ST super tough nylon engineering resins, which successfully replaced metals in a wide range of industrial, recreational, and military uses. Introduced in 1975, toughened nylon and its derivatives have grown in sales to more than 250 million pounds annually, and fostered development of new engineering polymers for automotive applications such as bumpers and exterior body panels. He also worked to develop superior manufacturing processes for other engineering polymers, including "Rynite" ST, "Bexloy" C, and "Delrin" ST, and the first commercial process for making "Minlon" HC and toughened "Minlon" 12T. His Du Pont career began in 1946. The Pederson Award is named in honor of the late **Charles J. Pedersen**, SM '27, a Du Pont researcher who won a Nobel Prize in chemistry in 1987. ... **Alexander M. Klibanov**, Course V professor, has been named to the board of scientific advisors at Molecular BioQuest, a company that develops and manufactures biotechnology and pharmaceutical products used in cancer testing, drug delivery systems, and laboratory products.



Anil Duggal

Anil R. Duggal, PhD '92, has joined the GE R&D Center in Schenectady, N.Y., as a physical chemist. Duggal is a member of the American Physical Society and the Materials Research Society. ... **Robert G. Griffin**, a physical chemist widely respected for his work in solid-state nuclear magnetic resonance (NMR), has been appointed director of the Francis Bitter National Magnet Laboratory (NML) where he has been a staff member since 1972 and associate director since 1989. Griffin, a Course V professor, has published more than

175 articles concerned with magnetic resonance methodology and applications of magnetic resonance to studies of structure and function of a variety of chemical, physical, and biological systems. Griffin succeeds J. David Litster, PhD '65 (VIII), who is MIT's VP and dean for research. . . . **JoAnne Stubbe**, a biochemist noted for her work in understanding the mechanism of physiologically active organic molecules, has been named the first holder of the John C. Sheehan Professorship, established by MIT to honor the scientist remembered internationally for the first useful synthesis of penicillin. Sheehan, emeritus professor at MIT, died last March. He had been a member of the MIT faculty since 1946. Stubbe holds joint appointments in both Course V and Course VII and is a member of the Whitehead Institute. She was elected to the National Academy of Sciences last May and is a member of the American Academy of Arts and Sciences. . . . **Scott C. Virgil**, Course V assistant professor, has been awarded a five-year fellowship worth \$500,000 by the David and Lucile Packard Foundation of Los Altos, Calif. Virgil, whose field is organic synthesis, was among 20 of the nation's "most promising" science and engineering researchers awarded the 1992 fellowships.

John W. Wilson, Jr., '39, of Cherry Hill, N.J., died on May 30, 1992. He worked for Mobil Oil as a research chemist for 41 years, retiring in 1981. Wilson was subsequently involved in civic interests, which included the Red Cross, the United Way, and the Boy Scouts of America. . . . The Association of Alumni and Alumnae has been notified that **Joseph Gilbert Hooley**, PhD '39, of Vancouver, British Columbia, died on June 25, 1987. No further information was provided.

VI ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Ahmed H. Tewfik, SM '84, EE '85, ScD '87, writes: "I was promoted to tenured associate professor at the University of Minnesota in June 1992. I also received a Taylor Faculty Development Award from the George Taylor Foundation in June 1992." . . . **Moise H. Goldstein**, SM '51, ScD '57, sends word from Baltimore, Md.: "I am pleased to announce that a Center for Speech Processing has just been established at Johns Hopkins with NSA support. The center has research and educational components. I am interim director—a director is soon to be named." . . . **John R. Samson, Jr.**, SM '72, EE '73, reports: "I received a doctorate from the University of Southern Florida in May 1992. My dissertation was entitled 'Optimizing Real-Time Fault Tolerance Design in VLSI and Wafer Scale Architectures for Real-Time Parallel Processing.'" . . . **Chander Ramchandani**, SM '70, PhD '73, writes: "I have been working for Computer Sciences Corp. (CSC) and am currently a project director in the System Sciences Division in Beltsville, Md. I am involved in a NASA contract with the Goddard Space Flight Center that includes systems engineering, system design, and implementation, and planning support." . . . **David F. Winter**, SM '48, sends word: "I am working with electric utilities and dairy farmers to minimize 'stray voltage' appearing in animal confinement areas that stresses the livestock, causing increased herd health problems and reducing milk production. I'm acting as an expert consultant with the public service commission in Wisconsin on the subject." . . . From Acton, Mass., **Robert H. Eisengrein**, SM '49, writes: "I just completed 10 years of retirement. I'm active physically—tennis, golf, and house & ground chores. I'm mentally active via local environmental affairs, using my technical know-how on remediating our Grace Superfund Site." . . . **Billy H. Burdine**, SM '57, reports: "Since my retirement from GTE Labs in 1986, I am devoting full-time to music. My wife, Nancy, an oboist, and two bassoonists, play in and manage the Concord Hill Musicians, a classical group performing for choruses, theater, ballet, and other events." . . . **Stephen N. Teicher**, SM '66, sends news: "I am VP of engineering for Kubota Pacific Computers. My wife and I live in Palo Alto with one

of our four kids. All kids are out of school, but Jennifer is applying to medical school for 1993-94." . . . **Lori Vinciguerra**, SM '87, writes: "**Ralph Vinciguerra**, '80, SM '82, PhD '88, and I have a new addition to our family, a baby daughter named Rachel Lynn, born May 14. I have decided to stay at home with Rachel and have started my own business writing educational software for high school science students. Ralph is still enjoying his work at TASC working simultaneously on network infrastructure, satellite data acquisition, and user interface design." . . . **John G. Linvill**, '43, SM '45, ScD '49, was honored recently by the William Jewell College in Liberty, Mo., for his career accomplishments in academic science and technology. Linvill, who completed undergraduate studies at William Jewell, was a Course VI assistant professor at MIT from 1949-51. After four years with Bell Laboratories, Linvill joined the Stanford University faculty in electrical engineering in 1955, where he remained until his retirement in 1990. During this time he chaired the Department of Electrical Engineering and served as associate dean of the School of Engineering. In 1971, his invention of the Optacon, a reading aid for the blind, was selected as one of the 100 most significant new technical products of that year. Linvill was appointed professor of integrated systems in 1981, also assuming the position of director of the Center of Integrated Systems, a facility which he helped found. . . . **Mohan Munasinghe**, SM '69, EE '69, and Alcira Kreimer are the editors of *Managing Natural Disasters and the Environment* (Environmental Policy and Research Division, World Bank), a collection of selected materials from the Colloquium on the Environment and Natural Disaster Management sponsored by the World Bank in June 1990. "The papers in the book explore the two-way relationship between environmental degradation and vulnerability to disaster—and their combined effects on both natural and man-made habitats," states the book jacket. Munasinghe is chief of the World Bank's Environmental Policy Division. He was previously division chief for energy and infrastructure operations in the Latin America and Caribbean Region. During 1982-86 he served as senior advisor to the president of Sri Lanka.

Course VI Professor Arvind (his full name), an internationally known leader in computer languages for parallel computation based on dataflow principles, has been selected as the first to hold the Charles W. and Jennifer C. Johnson Professorship in Computer Science. A gift from Jennifer C. and Charles W. Johnson, '55 (XVII), established the professorship in the Department of Electrical Engineering and Computer Science. Mr. Johnson is the founder of IMSL, Inc., of Houston. The Johnsons also support the Johnson Prize, given annually to an MIT undergraduate for outstanding performance on a thesis in computer science. From 1974-78, Arvind was an assistant professor at the University of California at Irvine, and visiting assistant professor at the Indian Institute of Technology in 1978, the year he joined MIT. He is a leader in addressing the fundamental issues of how to make computers more powerful by using the intrinsic parallelism in many physical applications. . . . The 1992 recipient of the Turing Award, the most prestigious technical award given by the Association for Computing Machinery, is **Butler W. Lampson**, adjunct professor in Course VI. The award is given annually to an individual selected for contributions of a technical nature made to the computing community that are of lasting and major importance to the computer field. Previous MIT winners were **Marvin Minsky**, Course VI professor, in 1969 and **Fernando J. Corbató**, PhD '56 (VIII), associate head and professor of Course VI, in 1990. The award is named after Alan M. Turing, a British mathematician and pioneer in computing who made pivotal contributions in cryptography in WWII.

VI-A INTERNSHIP PROGRAM

As I write, it's the middle of December and the area is still recovering from the Blizzard of '92. For the first time in several years I had to use the larger of

my two snowblowers to plow out my driveway, which I did four times in two days! I measured 17-21" of snow in my front yard and suffered major tree damage from the sticky, wet precipitation. Logan Airport had its greatest 24-hour rainfall on record. Just a few miles west and north of the city it was all snow. Winds were clocked at 77 mph at Logan and there were 35-foot waves in Cape Cod Bay. A home video of a house being washed away, intact, from Nantucket Island was shown on national TV—it was a fantastic sight.

Of more significance to you alumni/ae readers is the vote of the December 16, 1992, faculty meeting. Unanimous approval was given for the EECs Department's proposal for its new first professional degree—Master of Engineering or the MEng degree. A five-year program is proposed for this new degree. Some details of the proposal were spelled out in my *Technology Review* column of April 1992. More specific details will be given in one of my future columns—with emphasis on how VI-A will fit into this MEng program. (For an overall description, see John Mattill's *Under the Domes* article in the F/M '93 issue, pp. MIT 3-4)

A vote of approval was also given for adding the "Engineer in Computer Science" degree. This parallels the already existing degree of Electrical Engineer or EE.

Professor **Arthur B. Baggeroer**, SM '65, EE '65, ScD '68, who holds a joint appointment in the EECs and Ocean Engineering Departments and whom some may remember as their VI-A faculty advisor, has been awarded the Ocean Engineering Society's 1992 Distinguished Technical Achievement Award. He was cited for research that has focused on the application of advanced signal processing methods to underwater acoustics and geophysics.

On campus, co-chairing a career seminar in management consulting, was **Joseph R. Babiec**, '90, of Monitor Co. of Cambridge. His co-representative was **Douglas D. Rohall**, '82 (XVII), '82, older brother of VI-A'r **Steven L. Rohall**, '87, SM '88. Steve is employed by Bellcore of N.J. and represents them at VI-A's spring recruitment activities. . . . **Steven D. Levy**, '86, SM '86, is involved in an entrepreneurial venture as one of the founders of The MacGregor Group, Inc., in Boston (yes, they're from MIT's MacGregor House.) He was on campus this fall, recruiting in the Career Services office where I stopped in to say hello. . . . Another VI-A alum with whom I've had contact is **Andrew E. Moysenko**, '72, SM '74. Andy and I had lunch at Legal Seafood and talked about old times versus current business times. I learned that Andy's wife is finishing up her graduate nursing courses at the University of Lowell and that he has occasional contact with **Ernest D. Vincent**, '70, SM '72.

As time goes by on my emeritus appointment, I find I am more and more involved in archival matters relating to both MIT and the EECs Department. It helps that I've been on campus for 36 years and am involved in a lot of Institute activities and happenings. I've also become aware of the need to file and organize material that relates to activities and achievements at the Institute. I would, therefore, encourage any of you who have recollections of days at MIT or thoughts about how MIT has had an impact on your world of outside activity to communicate these to me. This will help to give proper perspective to the recording of our history.—John Tucker, director (emeritus), VI-A Internship Program, MIT, Room 38-473, Cambridge, MA 02139.

VII BIOLOGY

William M. Sidel, '69, PhD '78, has been appointed to the faculty of the College of Arts and Sciences at Rutgers University's Camden campus. Sidel is the author or co-author of 21 articles appearing in scientific journals and two book chapters. He has received seven research contracts and grants, including two from the National Institutes of Health and one from the Office of Naval

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N.A. Campagna, SM '67
F.W. Clark, SM '79
S.E. Gately, SM '85
W.E. Hodge, '77
W.E. Jaworski, ScD '73
C.A. Lindberg, '78
J.D. Okun, '75
K.J. O'Reilly, SM '80
A.J. Ricciardelli, '78
M. Walbaum, SM '88

Research. Prior to joining the biology faculty at Rutgers, Saidel taught and conducted research at the University of Maryland. He also taught at the University of California and Georgetown University and served as a research collaborator at the National Zoological Park in Washington, D.C. . . . **Alexander Rich**, the William Thompson Sedgwick Professor of Biophysics at MIT, has received an honorary Doctor of Philosophy degree from the Weizmann Institute of Science in Israel at a special session of the Institute's board of governors. He joins a distinguished list of past MIT recipients of honorary degrees from the institute, including **Jerome B. Wiesner**, **Victor Weisskopf**, **Frank Press**, and **Steven Weinberg**, SM '67, ME '69, PhD '70 (II). Rich was cited for "his exceptional contribution to the understanding of the molecular structure of nucleic acids and proteins, in particular his pioneering work on the elucidation of the mechanism of protein synthesis, the function of polysomes, the three-dimensional structure of transfer RNA and the left form of the DNA double helix." He was also honored for "his enlightened leadership in formulating science policy and furthering international scientific cooperation" and for "his outstanding commitment to the Weizmann Institute." He has been affiliated with the institute for more than 30 years and has been a member of the board of governors since 1976. Rich, an MD, is a world authority on the molecular structure of nucleic acids and the role they play in biological systems.

Gerald R. Fink, director of the Whitehead Institute, and **Phillip A. Sharp**, head of Course VII, have announced the establishment of the **Edwin C. Whitehead Prize in Biology** in memory of the Whitehead Institute's founder and patron, **Edwin C. "Jack" Whitehead**. The \$500 prize will be awarded annually by the Biology Department to MIT undergraduate students who, by virtue of their accomplishments and abilities, show outstanding promise for a career in biological research. Recipients of the prize will be selected from a pool nominated by the biology faculty. The prize also celebrates the partnership between the Whitehead Institute and MIT. All Whitehead members and associate members have faculty appointments in Course VII, and Whitehead laboratories provide research opportunities for many MIT students. Whitehead, a life member of the MIT Corporation, died on February 2, 1992, at the age of 72. His long career in science and industry included establishment of Technicon Corp., a company known worldwide as a pioneer in scientific and clinical instrumentation. Whitehead also was known for his philanthropic activities. In his later years, he was a founder and chair of the Board of Research!America, an organization devoted to focusing the entire nation on the urgency of investing in medical research.

VIII PHYSICS

David H. Vanderbilt, PhD '81, writes: "I am currently a professor in the Department of Physics and Astronomy at Rutgers University, and living in Princeton with my wife and two girls, ages 6 and 9." . . . **Charles W. Tittle**, PhD '48, reports: "I received a gold medal (top award) from the Society of Professional Well Log Analysts in 1991. I'm now a nuclear well-logging consultant." . . . **Warrington C. Cobb**, SM '55, PhD '62, is teaching at Frederick Community College in Maryland. . . . News from **Thomas P. Scott**, PhD '85: "On March 26, 1992, I was awarded the title of dad, by my son, Alexander Nicholas. As dad, I am working in the Massachusetts computer industry and would like to hear of the successes of other graduates of the Building 26 group, especially in contributing to the 'Tute." . . . **Slava Serota**, PhD '87, writes: "I was promoted to associate professor of physics with tenure at the University of Cincinnati. I had a baby daughter, Batsheva, on September 28, 1992." . . . **Jacqueline N. Hewitt**, PhD '86, who has been a

Course VIII assistant professor at MIT since 1989, has been selected as the Class of 1948 Career Development Professor for a three-year term. Hewitt's research involves applying radio astronomy, interferometry, signal processing, and image processing to basic research in astrophysics and cosmology. Her current research interests are gravitational lenses and VLBI (very long baseline interferometry) studies of dwarf Me (cool red) stars. . . . **Barton Zwiebach**, who joined the Course VIII faculty in 1987 as assistant professor, has been named the Class of 1922 Career Development Professor for a three-year term. His research is conducted in the Center for Theoretical Physics.

Contributions to the methodology of safety assessment of nuclear power reactors have won yet another award for Course XXII Professor **Norman Rasmussen**, PhD '56. He is sharing the 1992 Walter Ahlström Prize with Antti Vuorinen of Finland. Rasmussen directed the first major study in the U.S. that introduced probabilistic risk in evaluation of nuclear reactor safety. Since then, the methodology has been applied worldwide to study safety improvements in the operation of nuclear power reactors. . . . Buechner Physics Teaching Awards, recognizing outstanding contributions to the educational program of the Physics Department, are given annually to one faculty member and one student. This year's recipients are **Mehran Kardar**, PhD '83, the Class of 1948 Associate Professor, for distinguished lecturing in the graduate statistical mathematics sequence, and graduate student **Howard F. Sklar**, for outstanding performance as a recitation leader in the freshman sequence. The awards, which include a cash honorarium, were established in memory of Professor **William Buechner**, '35, PhD '39, head of the department from 1964-67, by his widow, Christine Buechner. Student evaluations are weighed heavily in the selection process. . . . **Jerome I. Friedman**, Institute Professor, Course VIII professor, and Nobel laureate, and **J. David Litster**, PhD '65, Course VIII professor and VP and dean for research, have been elected Fellows of the AAAS. Friedman was cited for "fundamental contributions to experimental particle physics, particularly for the experimental discovery of quarks," and Litster was cited for "pioneering studies in experimental condensed matter physics, particularly for research on liquid crystals."

Paul L. Hallowell, PhD '71, of Ashton, Md., died on October 9, 1992. He was an executive scientist at A.R.C. in Rockville, Md. . . . The Association of Alumni and Alumnae has been notified of the following deaths: **Harold C. Schweinler**, PhD '51, of Rockwood, Tenn., on August 25, 1990; **Eva A. Disharoon**, SM '35, of Pepperell, Mass., on April 10, 1984; and **Charles I. Beard**, PhD '48, of Mercer Island, Wash., on July 9, 1991. No further information was provided.

IX BRAIN AND COGNITIVE SCIENCES

Tomaso A. Poggio, the Uncas and Helen Whitaker Professor of Vision Sciences and Biophysics and co-director of the Center for Biological Information Processing, is the co-recipient of the 1992 Max Planck Research Award given by the Alexander von Humboldt Foundation and Max Planck Society, both of Germany. Poggio shares the prize, worth approximately \$130,000, with a research colleague, Manfred Fahlke of the Universitäts-Augenklinik Tübingen in Germany. They were chosen for their research accomplishments in the fields of vision, brain science, and learning.

X CHEMICAL ENGINEERING

Richard L. Bolin, SM '50, sends word from Flagstaff, Ariz.: "As director of the World Export Processing Zones Association (WEPZA), with 30

EPZs in 26 countries employing 450,000 export workers, I continue extensive traveling—(around the world four times in 1992 to manage conferences in Cadiz, Spain, and Colombo, Sri Lanka, with Mrs. Jeanne Brown Bolin to keep my head on straight). I was honored by being named to the board of advisors of the Lowell Observatory in Flagstaff this year. . . . **Kenneth A. Kirk**, SM '81, writes: "I'm in my 12th year at Corning, Inc. I'm currently a development engineer in the consumer housewares sector. I recently received my 1st patent for a method for improving binder burnout in leadless glass decorations. . . . From Brookline, Mass., **Edgar Gutoff**, SM '52, ScD '54, reports: "I am still enjoying my consulting work in the field of coating and drying continuous webs. This year my work has brought me to Mexico and Japan. . . . **Mark Manton**, PhD '86, sends word from Amsterdam, The Netherlands: "I'm still with Shell, although I'm now working on LubOil Processing from the central office in The Hague instead of doing research. I'm having fun!"

Phillip R. Westmoreland, PhD '86, has been presented with the "Outstanding Junior Faculty Award" by the Engineering Alumni Association and the College of Engineering at the University of Massachusetts, given annually to the top untenured faculty member of the college. Last year, he also won the R. A. Glenn Award of the American Chemical Society's Fuel Chemistry Division for its best paper in 1991. Most recently, Westmoreland was promoted to associate professor of chemical engineering and was awarded tenure. He is on sabbatical during 1992-93 at the National Institute of Standards and Technology in Gaithersburg, Md. . . . **Sheldon W. Dean**, '58, ScD '62, has been named an Air Products Fellow, the first appointee to a position Air Products and Chemicals, Inc., established recently to recognize exceptional achievement and distinction within the company's engineering and research organizations. In his new position, Dean is responsible for maintaining and strengthening the corporation's state-of-the-art competence in the areas of materials and corrosion protection, according to a company press release. Dean joined Air Products in 1975 as a senior corrosion engineer in the Corporate Engineering Department. Prior to his recent appointment, he was chief engineer of materials. Dean is the recipient of the Charles B. Dudley Award from the American Society for Testing and Materials, the honor award of the Philadelphia Chapter of the American Institute of Chemists, and the Frank Newman Speller Award from the National Association of Corrosion Engineers.



Lee McMaster

Starting in 1977, he held a variety of business and marketing positions before being named VP and general manager of the Specialty Polymers and Composites Division in 1982. With the acquisition of that business by Amoco Chemical in 1986, McMaster became VP and general manager of Amoco's performance products business and, in 1989, VP for corporate planning and development at Amoco Chemical. He returned to Union Carbide in 1989 as VP and general manager of new business development for the Polyolefins Division. In 1990 he assumed the additional responsibility of VP and general manager for the UNIPOL Systems Department. The Industrial Chemicals Division is the

world's leading producer of ethylene oxide and its derivatives, including ethylene glycol, which is used to make antifreeze/coolants and polyester. The division also manages the production of ethylene and propylene for Union Carbide, key chemical building blocks for most of the company's petrochemical products."

George W. Neuner, SM '66, was a featured speaker at a recent national seminar on biotechnology patents. Neuner, an intellectual-property rights attorney, is a partner with the firm Dike, Bronstein, Roberts, & Cushman, based in Boston. . . . **Graham A. Woerner**, SM '76, has been named a quality control manager at DeWal Industries, Inc. He joined the Saunderson, R.L., producer of fluoropolymer tapes and films last April as senior process and product engineer. Before joining DeWal, Woerner worked at the Rogers Corp. for 13 years. He holds a patent for isocore coax cable used in microwave and telecommunications applications and is the author of *Specifications for PTFE Dispersion*, which is pending adoption as a new specification by the International Standard Organization. . . .



Karen McNamara

will be used to create an endowment named after Fang's father, S.C. Fang, to support the Chinese Language Program within the school's Foreign Languages and Literatures Section. Fang is managing director and co-owner of Fang Brothers Knitting Ltd., which produces and markets clothes throughout the world. Born in Shanghai, Fang left China with his family for Hong Kong in 1949. He holds the Order of the British Empire and has twice served as VP of the MIT Club of Hong Kong. . . .

Robert C. Armstrong, Course X professor and executive officer of the Department, is the recipient of the Professional Progress Award for Outstanding Progress in Chemical Engineering given by the American Institute of Chemical Engineers. The \$4,000 award is given to a member who has not yet reached his or her 45th birthday and who has made a "significant contribution to the science of chemical engineering." The institute cited Armstrong's accomplishments as an educator and researcher in polymer fluid mechanics, numerical simulation of viscoelastic flows, transport phenomena, and applied mathematics. The citation said that Armstrong "was responsible for the first systematic mapping of a flow transition diagram for a complex flow of a polymeric liquid and the first accurate numerical method for computing the complex flow of polymer liquids." Armstrong is the author of a two-volume book, *Dynamics of Polymeric Liquids*, which was named a Citation Classic in 1988.

Hugh S. Graham, ScD '47, of Prescott, Ariz., died on October 7, 1992. Graham was a chemical engineer and section manager for Bethlehem Steel Corp. until retiring in 1974. He and Charles R. Hughes, another Bethlehem Steel engineer, invented a device to remove chemical compounds from industrial wastewater. The device was patented in 1973. Graham was an avid square dancer, teaching various groups since 1950.

X-A PRACTICE SCHOOL

From Englewood, Colo., **George O. Löf**, ScD '40, writes that he retired from the College of Engineering at Colorado State University, Fort Collins, last

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summer. He had been professor of civil engineering and founding director of Colorado State's Solar Energy Applications Laboratory, in which he continues to work part-time. Löf is also working part-time for two family companies—his son's enterprise in the design and manufacture of swimming pool covers that automatically close to save energy when the pool is not in use, and his daughter's energy-conservation consulting firm. . . . After five years with the United Nations in New York as assistant secretary general for science and technology, **Sergio C. Trindade**, SM '70, CHE '71, PhD '73, has rejoined SE²T International, Ltd., a company he organized in 1991. The firm, he says, "provides analysis and advice to business, government, and international organizations on the management of change, technological and otherwise; energy; and environmental problems." Both Trindade's home and business are in Scarsdale, N.Y.

At its annual meeting last fall, AIChE gave its first Clarence G. Gerhold Award to **C. Judson King**, SM '58, ScD '60, professor of chemical engineering at UC/Berkeley. The new \$3,000 prize recognizes "outstanding contributions in research, development, or application in chemical separations technology," which has been King's field of teaching and research since going to California in 1963. King has had increasing administrative responsibilities at Berkeley—after surviving as dean of the College of Chemistry, he became provost of Professional Schools and Colleges in 1987; his first experience in educational administration came in 1959, when he was an assistant professor at MIT and served for 2 years as director of the Bayway Station. A fellow of AIChE, King now holds a remarkable five of the society's major awards, the other four being the William H. Walker, the Food, Pharmaceutical and Bioengineering Division, the Institute Lecturer, and the Warren K. Lewis Awards. . . . While King was receiving his new prize from AIChE in Miami Beach last November, **Joseph J. Cramer**, SM '68, was taking office as a director of the society for a three-year term. Cramer is senior manager for air quality management at Brown & Root in Houston; for 20 years after leaving the Practice School he was with Stone & Webster in Boston and Cherry Grove, N.J. Cramer was chair of AIChE's Environmental Division in 1991.

With word of the death last July 25 of **Robert S. Hand**, SM '38, comes a complete biographical sketch tracing his life from his first school days in Shubuta, Miss. Hand entered MIT from Milsaps College in Jackson, Miss. After completing the Practice School, he worked first on a solar salt plant for West India Chemicals, Ltd., Inagua, the Bahamas, then at the Virginia Smelting Co. in Norfolk. After World War II, during which he served at Navy ship repair bases on the West Coast and in the South Pacific, Hand joined the Mississippi Agricultural and Industrial Board, moving in 1950 to the Engineering Department of the Du Pont Co. There his work as a project engineer took him to Northern Ireland and ultimately to the Netherlands, where Hand was deputy director of Du Pont's European design activities when he retired in the 1980s. He is survived by his wife, the former Jeanne Catherine Nealon, who continues to live in Chadds Ford, Pa.

Tracers from undelivered mail have brought the Association of Alumni and Alumnae word of the deaths in 1992 of two classmates—**Donald G. Jordan**, SM '41, of Reno, Nev., on May 3, 1992; and **John M. Sykes**, SM '41, retired from Evans Products Co., in Roanoke, Va., on February 23, 1992.

David E. Gushee, '50, and **Stanley V. Margolin**, '49, SM '50, contributed a very friendly review of *The Flagship: The MIT School of Chemical Engineering Practice 1916-1991* to the November 16 issue of *Chemical & Engineering News*. The book, they say, is "faithful to the reality that the concept of the Practice School is not easy to carry out." MIT's development and maintenance of it "reflects why [the Institute] is different from most universities and why that difference is worth preserving." Gushee is senior specialist in environmental policy at the Congressional Research Service of the Library of

Congress and Margolin is president of Network Consulting Inc., also in Washington. Both reviewers claim from their own experience that Practice School alumni "have a tremendous head start. . . . One of us, Margolin, is a Practice School graduate. His first job was made a whole lot easier because of this experience. Reviewer Gushee however, did not attend the Practice School. He remembers his first job as a painfully humbling experience. . . ."—John I. Mattill, *Technology Review*, Room W59-200, MIT, Cambridge, MA 02139.

XI URBAN STUDIES AND PLANNING

Laxmi Ramasubramanian, MCP '91, writes: "I am currently pursuing a PhD at the University of Wisconsin, working on geographic information systems applications to urban planning, addressing organizational and institutional issues." . . . **Dean R. Johnson**, MCP '78, reports: "In 1991, I received an MS in hazardous materials management from the Tufts School of Engineering. I hope to focus more on this aspect of environmental planning, perhaps in Eastern Europe or Russia. My interest is in public policy and decision making. I'd love to hear from others in the field." . . . News from **James E. Wallace**, PhD '72: "I led a group each of the last three years on a trip to a small village in the conflictive zone in the northern part of El Salvador as part of the Cambridge/El Salvador Sister City Project. Both communities now celebrate the peace accords of January 1993 and are pushing for compliance." . . . **Jeanne E. Strain**, MCP '82, reports that she is director of economic development for the City of Cambridge. . . . From Albany, N.Y., we receive news from **Dan S. Bernstein**, MCP '86: "I have begun a doctoral program in public administration at the Rockefeller College of the State University of New York at Albany, where I will focus my studies on public policy applications of system dynamics. My wife, Efrat Levy, and I are the proud parents of Dara, age 3, and Meirav, age 1."

Stephen T. Johnson, MCP '88, reports: "In August, I left my position as director of Land Policy for the Secretary of Environmental Affairs Susan Tierney, to become executive director of Sudbury Valley Trustees. SVT is a regional land trust operating in the Sudbury, Assabet, and Concord River valleys, west of Boston. I love my new job—hello to all my professors and classmates. My wife, Johanna, and two-year-old daughter, Caitlin, and I continue to reside in Sharon, Mass." . . . **Robert C. Reeves, Jr.**, SM '89, is a senior consulting manager with Kenneth Leventhal & Co. in Houston, Tex. The firm specializes in real estate and financial institutions. . . . **Julie M. Johnson**, MCP '88, writes: "Jose Sama, MAR '88, and I were wed September 5, 1992, in Wyoming. We live in Tampa, Fla., where Jose is a partner in Rañon & Partners, Architects, and I am a senior research associate at The Florida Center for Community Design and Research." . . . **Eric M. Alderete**, MCP '91, reports: "I have spoken to **Paul Lambert**, MCP '91, recently. Fortunately, he missed Hurricane Andrew and is doing well working at Goodken Research in Florida, analyzing national and state real estate markets." . . . From Washington, D.C., **Robert Schwartz**, MCP '68, sends word: "My family and I walked across England this past summer. My daughters are 11 & 14."

M. Ashraf Jan, MCP '70, reports from Brookline, Mass.: "As an airport advisor, I am a member of the FAA's advisory group to the Spanish Civil Aviation Authority. I have assisted in developing a long-range plan for the Madrid Airport that includes a new terminal and four parallel runways for independent arrival/departures. It will accommodate the demand beyond 2030. The first phase is being implemented. I am also assisting in developing a Spanish National Airport System plan." . . . From Houston, Tex., **James M. Symons**, SM '55, ScD '57, writes: "In the spring of 1992, I had a book about the environment published. It is a factual but non-technical book written for the public entitled

Plain Talk About Drinking Water. It is very popular—over 18,000 copies have been sold already. I am told that it will soon be available at the MIT Museum Shop. The publisher is the American Water Works Association, Denver, Colo.; call 1-800-926-7337 for copies." ... **Jeffrey B. Litwak**, MCP '92, sends word from White Salmon, Wash.: "I am a land use planner for the Columbia River Gorge Commission. The Gorge Commission is a bi-state agency created by a unique compact between the State of Oregon and the State of Washington in 1987 to protect and enhance the scenic, natural, cultural, and recreation resources of the Columbia River Gorge National Scenic Area. I am doing land-use planning, interpretation, and education planning, public outreach, and dispute resolution regarding getting local counties and Gorge residents to adopt and support a new scenic area management plan."

Parviz S. Towfighi, PhD '68, is a contributor to *Managing Natural Disasters and the Environment*, a collection of selected materials from the Colloquium on the Environment and Natural Disaster Management sponsored by the World Bank in June 1990. "The papers in the book explore the two-way relationship between environmental degradation and vulnerability to disaster—and their combined effects on both natural and man-made habitats," states the book jacket. Towfighi is chief of interagency affairs in the Office of the Executive Director of the United Nations Center on Human Settlements (Habitat). ... Course XI's fourth annual Professional Development Institute, co-sponsored by Tufts University's Department of Urban Studies and Environmental Policy and the MIT Center for Real Estate Development, was held during the month of January. The 26 courses offered included "The Art and Science of Negotiation," "Race and Culture Issues in the Workplace," "Environmental Mediation," and "Writing Successful Grant Proposals." Many of the instructors were MIT faculty and alumni/ae. Among the approximately 450 registrants was a large percentage of MIT grads who came from all over New England; some of whom brought members of their staffs with them. Nanette Robicheau, program director, deemed the institute an unqualified success, with most seminars running at full capacity.

Mark J. Waltch, PhD '77, of Cambridge, died on November 30, 1992, of leukemia. Waltch, a co-founder of Aldrich, Eastman, & Waltch, retired from the firm in 1987. In the following years he remained close to the firm and continued to provide wisdom and wit to his colleagues, who recalled him as "a great friend, wise advisor, and compassionate mentor."

XII EARTH, ATMOSPHERIC, AND PLANETARY SCIENCES

From Edwards AFB, Calif., **Pam Melroy**, SM '84, writes: "I graduated from USAF Test Pilot School in June of last year—am now a test pilot on the C-17, the Air Force's new transport/airdrop aircraft."



Wade Jensen

Kristine Holderied, SM '88, reports: "I'm now working for the U.S. Army Corps of Engineers as an oceanographer. I'm also going back to school for

Wade D. Jensen, SM '78, has joined the law firm of Anderson, Laffey, Eckert & Ferdon in Norwich, Conn. He was previously a member of DeSarbo, Jensen & Reichert of North Haven, Conn. He specialized in tax and estate planning. He has served on the South-eastern Connecticut Estate and Tax Planning Council since 1986, and is a member of the National Christian Legal Society. ...

my doctorate in physical oceanography at Old Dominion University in Norfolk, Va." ... **Lester J. Walters, Jr.**, PhD '68, sends news from Dallas, Tex.: "In September 1992, I began working for PSM International, Inc., as director of technical services. PSM is an environmental services company. My past experience in petroleum geochemistry has been very helpful."

XIII OCEAN ENGINEERING

Commander **William C. Gibson**, NA '51, sends word from Chatham, Pa.: "My wife, Elizabeth Hoagland Gates Gibson (Brown '46), and I are busy with an old stone house and barn and horses and goat here in Chester County. I'm still doing some marine survey work on Chesapeake and Delaware with Riggs Marine Appraisals, Ltd." ... **Keatinge Keays**, NE '55, writes: "I have moved from Salisbury, Md., to Annapolis, Md. I find there are a large number of Navy and Course XIII-A friends in the area." ... **James E. Soden**, SM '73, reports: "I am contracts manager at Sippican, Inc., in Marion, Mass. My daughter, Emily, is a student at Tabor Academy, and heads to college this fall." ... Commander **Tajr Hull**, OCE '80, sends word: "I moved to Virginia this past summer. I'm now working in the program review division at USCG Headquarters, putting together 1994 & 1995 budgets for the Coast Guard." He and his wife, Kristen, were expecting a third baby in January as of this writing. ... From Seattle, Wash., **John Waterhouse**, SM '84, writes: "I have survived five years as president of a naval architecture and marine engineering firm. Learning the business side of engineering has been challenging and terrifying. We have been very busy lately designing ferry boats, barges, and sonar domes for Egyptian submarines! I hope that 1993 is a good year for my company, Elliott Bay Design Group, and all firms that employ Course XIII graduates." ... Commander **Arthur J. Coyle**, NE '54, (USN, ret.), reports: "I retired from Battelle Columbus Laboratories. I'm keeping active jogging and playing golf, with some consulting and volunteer work."

Kurt Gustafson, SM '68, NE '68, sends news: "I retired from the U.S. Navy on December 1, 1991. I went to work as program manager for computer application development at the Bureau of Alcohol, Tobacco, and Firearms in Washington, D.C. I moved to Germantown, Tenn., in August 1992, but still commute to work in D.C." ... **William A. Kerr, Jr.**, SM '67, NE '67, writes from Hanahan, S.C.: "I'm currently the division manager for the In-Service Engineering Division of Milcom Systems Corp. The company specializes in the installation, upgrading, and in-service engineering for shipboard and shore site electronic communication and telecommunication equipment and systems. I went with Milcom in March 1992." ... From Athens, Greece, **Harilaos N. Psarftis**, SM '77, PhD '79, writes: "Born to my wife, Alexandra Manousaki, and me, Anastasia, our first child (June 1992). After Larry Bird's retirement, I am thinking of returning to Boston to help the Celtics." ... **John D. Bowen**, SM '87, NE '87, sends word: "I retired from the Navy in July of last year. I am currently with the Applied Research Laboratories of the University of Texas at Austin as a research associate." ... From Potomac, Md., **Ki-Han Kim**, SM '75, PhD '77, reports: "I am currently engaged in R&D at the David Taylor Research Center in the capacity of naval architect."

News from Commander **R. Malcolm Fortson**, SM '74 (XV), SM '74, (USN ret.) in Portsmouth, Va., where he is director of the Total Quality Institute: "The local Total Quality Institute provides community support to small business in the development of continuous improvement processes. As a joint project between the local chamber of commerce and community college, larger industry partners are sharing their experiences in the local community and with suppliers. Clients include Anheuser-Busch and Siemens Automotive." ... **Lewis R. Grigg**, SM '90, NE '90, SM '90 (II), writes: "I am

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working for the supervisor of shipbuilding, conversion, and repair in Pascagoula, Miss., as ship superintendent for the amphibious assault ship *Kearsarge*, under contract at Ingalls Shipbuilding. *Kearsarge* (LHD-3), is scheduled to deliver in May '93." ... The Department of Navy informs us that Navy Lieutenant Commander **Daniel J. Peters**, SM '89 (III), NE '89, "has recently been deployed aboard the aircraft carrier *Kitty Hawk*, homeported in San Diego, on a six-month deployment to the Western Pacific. Peters will participate in a variety of training exercises to increase combat readiness, visit foreign ports, and conduct operations as directed. The *Kitty Hawk*'s mission will follow the Navy's new strategy entitled '...From the Sea,' which shifts the sea services' focus from a global threat to regional challenges and concentrates on near-land warfare and maneuver from the sea. The new direction emphasizes strategic deterrence and defense, forward presence, crisis response, and reconstruction. It will provide the U.S. with naval expeditionary forces operating forward from the sea that are shaped for joint operations and tailored for national needs. The battle group is comprised of three guided missile cruisers, a guided missile frigate, a replenishment ship, and two attack submarines."

The Society of Naval Architects and Marine Engineers has awarded its David W. Taylor Medal for "notable achievement in naval architecture and/or marine engineering" to **Justin E. Kerwin**, '53, SM '54, PhD '64, professor of naval architecture in Course XIII. In selecting Kerwin the society said: "in recognition of over three decades of developing rational methods for the design and performance prediction of marine propulsions." It added: "With his students, Kerwin has carried out many experiments in the MIT Variable Pressure Water Tunnel, defining real-fluid effects on trailing-vortex wrap-up, cavitating sections, and propellers. He has incorporated such phenomena into his design programs to achieve the realism required for practical application. Although his computer codes are based on fundamental fluid mechanics, Kerwin has

always ensured that they are user friendly to practical designers. The significance of his work in the marine world is demonstrated by the daily use of his programs by naval architects and researchers throughout the world. He has been responsible for developing the family of programs used to design propellers for the U.S. Navy." Papers written by Kerwin have received the Society's Captain Joseph H. Linnard Prize three times."



Walter Cantrell

(NAVSEA). During the period of April to June 1991 he was appointed acting commander, NAVSEA. In his current duty as Commander of SPAWAR, Cantrell directs the work of more than 8,000 military and civilian personnel who strive to provide the latest and finest technology and equipment to the Fleet. Established in 1985, SPAWAR is the Navy's one organization responsible for "cradle-to-grave" functions for all command, control, and communications systems and ocean surveillance and the integration of those systems. The Naval Command, Control and Ocean Surveillance Center (NCCOSC) in San Diego is the Navy Warfare Center reporting to SPAWAR. In addition to NCCOSC and its 10 activities, SPAWAR manages four university laboratories and the Navy Management

Rear Admiral **Walter H. Cantrell**, SM '65, NE '65, assumed command of the Space and Naval Warfare (SPAWAR) Systems Command on September 30, 1992, in a ceremony aboard the USS *Barry*, in Washington, D.C. According to a Department of Navy news release, "From June 1990 until assuming his present duty, Cantrell was vice commander of the Naval Sea Systems Command

Systems Support Office." Rear Admiral **Arthur B. Engel**, SM '45, (ret.) of Palm City, Fla., died on November 10, 1992. Engel was the only person ever to have served as superintendent of two federal service academies. He was superintendent of the Coast Guard Academy from 1967-70, a period marked by growth there. He then retired from the Coast Guard to become superintendent of the Merchant Marine Academy. Engel was abruptly dismissed in September 1979 from the Merchant Marine post. No official reasons were given for his ouster, although reports swirled that it had to do with a quarrel over the future direction of the academy. After he was fired, which he said caused him no regret whatsoever, it was reported some students and influential alumni favored a more civilian approach to the academy, which trains officers for American merchant vessels. Engel served in the Atlantic during WWII. After the war he served on a number of cutters, including the *Klamath*, which he commanded. ... **Thomas L. Moran**, NE '52, of Kensington, Md., died on July 8, 1991. He was retired as staff engineer at Vitro Laboratories. No further information was provided.

XIV ECONOMICS

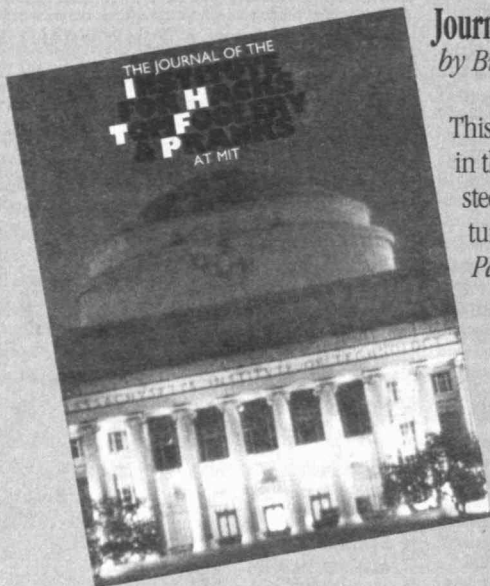
From Gainesville, Fla., **Jonathan Hamilton**, PhD '82, writes: "I spent the last spring semester as a visiting scholar at Institut D'Anàlisi Econòmica at the Universitat Autònoma de Barcelona. I am returning there this summer for one month." ... From Washington, D.C., **George Galster**, PhD '74, sends word: "I co-edited *The Metropolis in Black and White: Place, Power, and Polarization* (Rutgers University Press, 1992) with Edward W. Hill, MCP '76, PhD '81 (XI), who is an assistant professor at Cleveland State University." ... **Edward Moscovitch**, PhD '66, reports: "My book, *Mental Retardation: How Does Massachusetts Compare?*, was published in

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1991 by the Pioneer Institute. As consultant to the Massachusetts Business Alliance for Education, I have drawn up the school finance portion of one of the major school reform bills presented to the Mass. Legislature last year."

William D. Nordhaus, PhD '67, the A. Whitney Griswold Professor of Economics at Yale University and a former provost there, has been named acting VP for finance and administration through the end of the current academic year. In his new role, Nordhaus has assumed responsibility for the administrative areas of finance, human resources, telecommunications, facilities planning and facilities management, auxiliary services, auditing, and investments. A specialist in macroeconomic theory and policy, Nordhaus most recently has pursued research interests in the interaction of economic growth, energy use, natural resources, and the environment. From 1977-79 he served as an economic adviser to President Jimmy Carter with special responsibility for regulatory reform, tax and energy policy, and international trade. As Yale's provost between 1986 and 1988, he initiated efforts to incorporate long-range planning into university budgetary processes.

XV MANAGEMENT

From San Francisco, **Elana Lichtenthal**, SM '88, writes: "I'm still enjoying Northern California, working for Oracle as a sales consultant with our Latin American and Caribbean subsidiaries." ... **Alan Orloff**, SM '87, sends word from Herndon, Va.: "It has been a busy 18 months. I got married to Janet Laubgrass, we moved to a new house, I left my job at SEMA, Inc., to start my own business, and we had a beautiful baby boy, Mark. Whew!" ... News from **Arnold J. Rothstein**, SM '51, in North Palm Beach, Fla.: "While continuing my industrial/commercial energy services company, I found time to represent the ASME on a mission to create a technology transfer pilot project based in Asunción, Paraguay. Over 50 engineers from Paraguay, Argentina, and Brazil participated in the discussions as did over a dozen ministerial departments and major industrial leaders—some immediate action was taken there with real and long-term results hoped for in two to five years and beyond." ... **Marie Kaufman**, SM '83, reports from Sterling Heights, Mich.: "My husband, Dave, and I are very excited about the birth of our first child, Nicole Marie. She was born on November 6, 1992, weighing in at a healthy 8 lbs. 4 oz." ... **Blaire Martin Larson**, SM '89, who is a managing associate at CSC Index in Chicago, Ill., lives in Creve Coeur, Mo. She writes: "Dick and I are enjoying life in St. Louis, where we've lived for the last two years. I'm still racking up the frequent flier miles, shuttling back and forth to my office in Chicago and wherever my consulting work takes me. Fellow classmates—give me a call if you're in St. Louis or Chicago!"

Susan Lio, SM '80, is a principal at International Business Development in Westford, Mass. She reports: "I am working with small- to medium-sized companies interested in exporting to Mexico. I would welcome calls from any interested parties." ... **Nicholas Fiekowsky**, SM '78, a business architect at American Airlines, writes: "I have moved from superconducting to organization design and business process re-engineering. A new set of challenges and a larger scope of action." ... From Cambridge, **Bernard R. Horn, Jr.**, SM '80, reports: "I recently joined MDT Advisers, Inc., as an investment officer with primary responsibility for public equities under a global mandate. MDTAI was a client of mine before I joined the firm. MDTAI and its seven investment officers manage the \$600-million Memorial Drive Trust, the profit-sharing plan for Arthur D. Little, Inc., employees. In addition to investing in public equities, the trust actively invests in public and private debt, real estate, oil & gas, and venture capital." ... From San Diego, Calif., where she is assistant to the COO at the UCSD Medical Center, **Elizabeth Coley**, SM '87,

writes: "My husband, Brian, and I are pleased, excited, and exhausted to announce the birth of our son, Ian Alexander Coley, on October 27, 1992. He tipped the scales at 10 lbs. 8 oz., and just about everything else was three standard deviations above the mean as well. We are having fun learning to be a family while I take four months away from work."

Nicholas Manganaro, SM '84, sends word: "I am enjoying living back in Philadelphia where I grew up. As a portfolio manager at The Glenmede Trust Co., I am managing around \$2 billion in mortgage-backed securities, which keeps me hopping. We have also just started a very small non-dollar bond fund that adds some spice to the mix of news and decisions facing me on a daily basis. Still I'm able to enjoy my three obsessions: work, women, and motorcycles." ... **Peter Lucas**, SM '85, is VP for sales at State Street Bank in Boston. ... **Nina McIntyre**, SM '84, reports from Winchester, Mass.: "I was recently promoted to director at Lotus Development Corp. in Cambridge. I am now managing spreadsheet product managers, the Usability Lab, the Performance Lab, and the spreadsheet beta test group. I'm working hard, but having a ball. My daughter, Ellie, is four years old and is liking school." ... Word from **Peter B. Blanton**, SM '81: "My wife, Penny, and I and our two daughters, Rebecca and Jessica, enjoyed spending Halloween with **Constantine Loizides**, SM '81, and his wife, Eleni, and two daughters, Christina and Sophia. Constantine and his family are living in London, where he is a managing director at Bankers Trust." ... **R. Brian Fifer**, SM '71, is president and CEO of Aqua Care Systems, Inc., in Miami, Fla. ... **Chris Regan**, SM '89, is a managing associate at CSC Index in Cambridge. He writes from Stoneham, Mass.: "My wife, Sue, and I have a new son, Matthew, born June 23, 1992." ... Word from **John H. Halford, Jr.**, SM '40: "I'm happily retired at Shell Point Village in Fort Myers, Fla., with my wife, Laura Thickem, Wellesley '38."

Larry P. Yermack, SM '62, reports: "After 28+ years with RCA and GE, I joined Fairchild Space and Defense Corp. last year in Maryland as president of Fairchild Space. The transition from New Jersey to Maryland has been a lot of fun for Elizabeth and me." ... **George E. Williams**, SM '49, who is retired as VP of United Technologies in 1982, writes from Naples, Fla.: "I'm very busy with yachting, swimming, club affairs, travel, civic activities. How did we find time before retirement to work full-time at a job?" ... **John J. Becker**, SM '85, reports: "I have changed jobs at Kraft USA, and am now director of strategy for Kraft's Retail Cheese Division. In addition to our overall business strategy, I have marketing responsibility for our private-label cheese business and sales through club stores." ... **David R. Zibbell**, SM '63, sends word: "I've formed Gahran & Zibbell Management, a new turnaround management consulting partnership, with another MIT alumnus, Jack Gahran, '55 (II). My wife, Marilyn, has a new position as a teacher of English as a second language in Cherry Hill, N.J. Daughter Miriam graduated from the University of Pennsylvania magna cum laude, is now employed by a Philadelphia law firm, and will attend law school in 1993. Daughter Rachel is a junior at Rutgers and will spend her second semester abroad at Hebrew University in Jerusalem."

Mike Iles, SM '85, is VP at Pre Need Systems in Garland, Tex. He writes from Rockwall, Tex.: "Kim and I are expecting our first child (due date January 5) and are excited about the challenge and changes that come with starting a family. A few years ago, I followed the playbook from Business Strategy 101, and started a business which fulfilled market needs in a defensible niche. At present, business has gross sales of \$600K/month and employs 45. Things are good!" ... **Benjamin P. Hollin**, SM '85, reports: "After almost three years in OEM account management at Adobe Systems, I recently assumed the newly-created position of manager of Asian Technology Planning." ... **Robert A. Bassett**, '75, reports that he was admitted to the Connecticut bar in December 1991. He is currently assistant corporate secretary at Praxair, Inc., in Danbury, Conn. ...

Mike Thiel, SM '71, sends word: "I have moved to the Portsmouth, N.H., area to be near the ocean and am building a home overlooking it. My company, Hideaways International, Inc., is growing and has outgrown its facilities. We are in the process of moving it (out of 'Taxachusetts') to the New Hampshire seacoast area." ... From Cambridge, **Cyrus Mehta**, SM '70, PhD '73, writes: "**Nitin Patel**, SM '64 (VI), PhD '73, and I started Cytel Software Corp. in 1987. Cytel makes three statistical packages; StatXact, a package for exact nonparametric interference; LogXact, a package for exact logistic regression, and East, a package for planning and interim monitoring of clinical trials. The packages are very popular with the biomedical community."

Teri Huttner McRae, SM '79, reports: "I live in Littleton, Mass., with my husband, Allen, and son, Brian, born July 31, 1992. I am currently working at my own computer consulting business and enjoying being home with my son." ... **M.R. Strasmore**, SM '73, is president of Silvermine Consulting Group in Darien, Conn. He sends an update: "Still doing well working large organization on managing technology—accelerating new product commercialization and creating new organizational designs and processes incorporating ideas from 'the learning organization.' Would like contact with people who know of small company turnaround/general management opps. Daughter, Sharada, is 5, and is delightful, musical, and artistic. Wife, Kassandra, is an acupuncturist with an office next door to mine. We all practice Siddha meditation and teach and have a center in our home." ... **Tammy and Bruce D. Werner**, SM '86, are happy to announce the birth of Amy Rose Werner on July 17, 1992. ... **Andrew R. Gurbaxani**, SM '91, reports: "I completed my first year in information systems consulting at Arthur D. Little, Inc., in Cambridge (I am recruiting coordinator for ADL at Sloan). I'm interested in hearing from those of you in start-up/young companies relating to information systems/networking/communications. I'm working as an information systems planner for clients in a wide range of industries (utilities, travel and tourism, and academia). Enjoyed trips to the Grand Canyon, Montreal, and Bombay, India, (for my brother-in-law's wedding) this summer."

From Bothell, Wash., **Jeff Eder**, SM '82, writes: "I used the start-up of my new company, Fiscal Data Systems, Inc., as my excuse to return to the Seattle area. We plan to do complete financial outsourcing for some of the small and mid-sized firms in the area. So far, everything has cost a little more and taken a little longer than expected, but we're having more fun than expected, so it's OK." ... **Guy M. Barudin**, SM '87, sends word: "I'm currently VP for business development at Liberty Technologies in Conshohocken, Pa., manufacturers of diagnostic systems for process machinery. I escaped Wall Street last year!" ... **William S. Selby**, SM '85, sends an update: "I am a senior VP at Gabelli & Co., an investment management firm located in Rye, N.Y. I was married on July 18 to Lisa Fisher—no children, yet!" ... **Amos J. Rogers III**, SM '89, writes: "Catherine and I have a new son, Christian Joseph Rogers, born October 31, 1991. I recently joined the Asset Disposition Group of Citicorp Real Estate, Inc., in New York City, as a senior account officer." ... News from **Sven A. Wehrwein**, SM '80, in Minneapolis: "I'm a partner at Wessels, Arnold & Henderson, an investment banking boutique focusing on healthcare companies. Our third child, Lucas Oakes Wehrwein, was born on October 28, 1992." ... **F. Peter Zaballos**, SM '90, writes from Boston: "We are happy to say that we are expecting our first baby in April! I've also joined C. Cube Microsystems, a California-based digital video technology start-up, as director of East Coast Operations, which keeps me very busy."

Richard S. Livingston, SM '84, reports: "I married Janet Behrend on January 5, 1992. Got pregnant on honeymoon!! New baby boy, Samuel Edward, was born on September 28, 1992. I formed a new real estate company, Cypress Homes of Maryland, in the summer of 1992." ... From Cambridge, **Lisa Butler**, SM '90, writes: "I recently joined several other Sloanies at the wedding of

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Thom LeFevre, SM '90, and Ellen Lederman, SM '91. After their honeymoon, both returned to their jobs at Otis and World Bank in Prague. I recently started a new job at Polaroid as a marketing program manager, working on electronic imaging." . . . News from Commander **R. Malcolm Fortson, SM '74 (XIII), SM '74, (USN ret.)** in Portsmouth, Va., where he is director of the Total Quality Institute: "The local Total Quality Institute provides community support to small business in the development of continuous improvement processes. As a joint project between the local chamber of commerce and community college, larger industry partners are sharing their experiences in the local community and with suppliers. Clients include Anheuser-Busch and Siemens Automotive." . . . **Susan Egnoto, SM '84,** writes from San Francisco, where she is a marketing consultant at Insight Consulting: "I left Silicon Graphics on December 4, 1992. I plan to spend more time with our daughter, Grace, (now over 1 year old) and continue working in the graphic arts industry through my consulting practice."

Lynn Senne, SM '77, is a senior VP at Hagler, Mastrovita, & Hewitt in Boston, Mass. . . . **Jay Massimo, SM '87,** sends an update: "I continue in High Technology Lending, a division of Bank of Boston, providing financing to medium- and later-stage technology companies, both in the Northeast and Southeast U.S. (N.C., S.C., Ga., Fla.) My wife, Doryann, is halfway through an MA in counseling psychology. Our daughter, Diana, is 3 1/2 years old going on 30! In general, things are great! How time flies!" . . . In New York City, where he is manager of telecommunications marketing at American Express TRS, **Michael P. Brzozowski, SM '90,** reports: "After joining the Corporate Card Division of TRS, I have been part of a cross-functional team consisting of marketing (myself), operations, systems, and customer service that recently launched a new product to small businesses called CorporateLink. CorporateLink is a joint marketing agreement between Amex and AT&T to provide small business CM's the capabilities of an AT&T calling card with their corporate card. CM's now have one card to carry and one bill to review." . . . **Stuart Grief, SM '90,** who is a consultant at the Boston Consulting Group, writes: "Amy and I had our second daughter, Brooke, on April 28, 1992. Brooke joins her older sister, Jordan, born July 12, 1990. The kids—and the dog—are keeping us very busy and have forced us to acquire a minivan to get around in! Needless to say, BCG is keeping me pretty busy as well!"

C. Lawrence Meador, SM '72 (II), SM '72, sends word from Wayland, Mass.: "I was elected to the American Society for Macro-Engineering board of directors in October 1992. I started a consulting and system development firm named Management Support Technology in February 1992. Sales exceeded \$1,000,000 within nine months." . . . **Bernard J. Jourdan, SM '70,** is VP for operations at Schindler-France, located in Velizy. He writes: "I'm doing well in Paris with Françoise, my wife, and our two daughters. I would be happy to meet friends from the Sloan School in Paris." . . . **Kasey Byrne, SM '90,** reports: "I'm still at McKinsey in LA; recently saw **Peter Moran, SM '90 (VI), SM '90,** at a firm conference. I married Dan Bronfman May 16, 1992 in LA; now living in Santa Monica with our dog, Sophie. We saw **Susan Martin Rousselot, SM '90,** and **J.B. Rousselot, SM '90,** at an LA party held for them honoring their July 4th (Paris) wedding. They were on their way back from their honeymoon in Tahiti. Also at the party was **Maria Karahalis, SM '90.**" . . . **Nick Pudar, SM '90,** and **Pamela Pudar, SM '90,** are the proud parent of James Michael Pudar, born April 21, 1992. . . . **Hans J. Dendl, SM '59,** is president of Hade in Germany. He writes: "I'm working for Social Security Germany giving advice on new accounting and administration systems. I'm also doing social/political consulting."

Daniel A. Abut, SM '91, sends word from New York City where he is an associate in capital markets for Latin America at J.P. Morgan & Co.: "It has been more than one year now since Sonia and I

arrived in New York, and things are going terrific. Sonia got a job at the United Nations and I'm really loving what I'm doing: advising Latin American companies to raise capital, through debt and/or equity. I travel a lot throughout Latin America, which has allowed me to keep in touch with **Ricardo Paz, SM '91 (in Chile), Ricardo Vasi, SM '91 (in Mexico), and Rodolfo Baquerizo-Alvarado, SM '91 (in Ecuador).** As you see, the 'Latin Mafia' is still alive. It looks like I will be in New York one more year. So, keep in touch." . . . **Brad Peterson, SM '89,** is director of the Data Center & Network Operations at Pacific Bell in San Diego. His daughter, Kelly Nicole Peterson, was born May 14, 1992. . . . **Jim Stoner, SM '61, PhD '67,** is a professor of management systems at the Graduate School of Business at Fordham University in New York City. He reports: "My biggest surprise of 1991-92 was the gift of more than \$1 million for the initial endowment of the James A.F. Stoner Chair in Quality Leadership at Fordham University. Brent and Bob Martini of Bergen Brunswig Corp. made the personal gift in acknowledgement of my contribution to their company's work in adopting total quality management. Brent was an MBA student of mine at Fordham and arranged for me to work as a consultant to the company. The chair will be used to acknowledge the contribution of Fordham faculty members to the teaching of TQM at Fordham and to the use of TQM in managing the business schools and university."

Sharyn Hardy Gallagher, SM '85, writes: "I'm keeping very busy working full-time at Digital Equipment Corp., teaching part-time at the University of Massachusetts at Lowell, serving on the board of the Lowell YMCA, and being a wife and mother. My husband's jewelry store in Chelmsford, Mass., is doing well despite the economy." . . . **Michael Kasinkas, SM '82,** reports that he has a new job as general manager at Angio Medics II, a medical device start-up in Minneapolis. . . . **Donald L. Isaacs, SM '74,** has been named vice-chair of the board and director of the board of directors at BayBanks, Inc., in Boston. He continues as chair and CEO at BayBanks Systems, Inc., in Waltham, Mass. . . . **Clay Johnson, SM '70,** is deputy director and COO of the Dallas Museum of Art. He was formerly president of The Horchow Collection, also in Dallas. . . . **Sandra L. Helton, SM '77,** has been



Sandra Helton

named president of the board of trustees of the Rockwell Museum. The museum is known for the largest collection of Carder Steuben Glass from 1903-32. Helton is VP and treasurer of Corning Inc. Currently listed in *Who's Who of Finance and Industry*, Helton also serves on the board of managers of the Arnot Ogden Memorial Medical Center, as a member of the Associate Business Council of the Metropolitan Museum of Art, as treasurer of the Corning Museum of Glass.

Rebecca M. Henderson, '81 (II), has been selected as one of the first two holders of the Robert N. Noyce, PhD '53 (VIII) Career Development Professorships for a two-year term. Henderson joined Sloan in 1988 as assistant professor of strategic management. Her research is in the economics of technological change, technology strategy, manufacturing strategy, and the management of new product development. . . . **C. Lawrence Meador, SM '72 (II), SM '72,** president of Management Support Technology Corp. and a lecturer in the School of Engineering at MIT, has been elected to the board of directors of the American Society for Macro-Engineering. Meador is well known as an important contributor at MIT to the development of the field of Decision Support Systems (DSS),

computer-based applications used to improve organizational effectiveness and performance of senior managers and policy makers. His consulting and research have focused on how organizations should use advanced information technology to dramatically improve organizational effectiveness, productivity, quality, flexibility, and speed.

James E. Fanning, SM '63, PhD '64, of Madison, N.J., died on October 13, 1992 after a lengthy battle with cancer. Fanning was the former president of the investment management firm of Rockefeller & Co., Inc., in New York City. He joined the investment staff of the Rockefeller family's offices in 1966, he later headed the investment group, and became president when it was expanded and incorporated in 1979. He stepped down as president in 1982 and continued his association with the firm as a consultant until November 1991. Earlier in his career, Fanning had served at Banker's Trust Co. in New York City as an assistant VP. He was also an adjunct associate professor of finance at the New York University Graduate School of Business Administration. He was a member of the American Financial Association and the American Society of Security Analysts. . . . The Association of Alumni and Alumnae has been notified that **David Nai-Chee Tso**, SM '74, of Houston, Tex., died on July 22, 1992. No further information was provided.

Sloan Fellows

Don Huberts, SM '92, is area assistant for Japan and Korea at Shell International Petroleum Co. in London. He writes: "Vivienne and I have settled in well in our new home in England. I am looking after Japan and Korea, two very interesting countries. On my next trip to Tokyo I hope to visit some of my Sloan Fellows classmates. Vivienne is now working as a dental surgery assistant, which she enjoys very much." . . . **Bob Rollins**, SM '70, is VP and corporate secretary at the Hagerstown Roundhouse Museum, Inc., in Hagerstown, Md. He sends word: "I'm working to save and rehabilitate a 40-acre roundhouse and shops of the Western Maryland Railway. The museum opened in 1990 and will feature working railway shops and a tourist train." . . . From Clemmons, N.C., **Rodney L. Booker**, SM '57, sends word: "I'm still working as president of The Tanglewood Group. Going to take a trip 'round the world' in '93—we hope. I'm going to retire when I 'wear' out. Still have great memories of the Sloan Program." . . . **Nelson Tsao-Wu**, SM '84, writes: "I am close to the end of my three-year assignment in Singapore, going back to the States at the end of 1992. I started an institute in Singapore on information communication (at the graduate level) to train people in communication software management. It is a joint collaboration between my company (AT&T) and the National Computer Board of Singapore. Over nearly 3 years, we have graduated more than 100 students."

Joseph M. Gingo, SM '83, has been named VP for Tire Technology (worldwide) at the Goodyear Tire and Rubber Co. in Akron, Ohio. He was formerly chair and CEO at Air Treads, Inc. (a subsidiary of Goodyear), in Hapeville, Ga. . . . **F. Duane Ackerman**, SM '78, has been named CEO of BellSouth Telecommunications, Inc., the unit which oversees local telecommunications operations for the company in the southeastern United States. Ackerman, who joined Southern Bell in Orlando, Fla., in 1964, most recently was president and COO at BellSouth. Serving in



F. Duane Ackerman

positions of increasing responsibility in Florida and in Atlanta, he became general commercial and marketing manager for Southern Bell's North Carolina operations in 1978. In 1979, he was named VP

for Southern Bell's network operations and in 1983 was assigned to oversee planning and development for BellSouth Corp. In 1985, Ackerman was named executive VP and in 1989, was appointed vice-chair for finance and administration at BellSouth. He assumed the position of president and COO in 1991.

Senior Executives

Karl F. Lang, '61, writes: "My wife, Alberta, and I continue to enjoy an active life in retirement. Our 50th wedding anniversary was spent in Germany. Looking forward to my 80th birthday on January 1, 1993. We send greetings to our friends from the Class of '61." . . . **James M. Connors**, '63, has retired from the Grumman Corp. . . . Also retired, **F.J. Long**, '66, of Windsor, England, sends word: "Activities in voluntary sector include chair of the board of governors at the Leys School (independent) in Cambridge, chair of the publications/resources committee in the U.K. Methodist Church, and chair of the Windsor and Eton Civic Society." . . . **Daniel M. Ameline**, '86, is general manager of Mouvement Français Qualité in Nanterre, France. He writes: "A new quality nationwide organisation has been launched under sponsorship of all major companies and the Minister of Industry to promote quality and to develop and divulge methods of quality insurance as well as total quality for all activities starting with 3,000 members; a lot of activities are running."

Harun Bin Din, SM '86, send word: "Having retired from the civil service in 1989, I have now been reappointed by the Government of Malaysia as chair of the election commission in Malaysia. The commission's functions are to carry out the delimitation of federal and state constituencies, the registration of voters and the election of members to Federal Parliament and state legislative assemblies." . . . **Christian Godde**, '91, reports from Paris where he is managing director and deputy chair at Astra-Calve (a Unilever subsidiary): "I'm back to Europe from Zaïre. At the end of January 1992, I spent 5 months at our Headquarters for Foods in the Netherlands. I am now appointed in France in one of our large European foods companies and should become its president/CEO early in 1993. The company is involved in edible fats, cheese, dressings/condiments, deep frozen confections and bread, bakery materials, etc." . . . **Sheldon Horning**, '86, has been named executive VP at Cincinnati Bell, Inc. He continues as president and CEO at Cincinnati Bell Information Systems (a subsidiary of Cincinnati Bell, Inc.) in Fairfax, Va.

Management of Technology Program

On December 10, 1992, **Edward B. Roberts**, '57, SM '58 (VI-A), SM '60 (XV), PhD '62 (XIV), the David Sarnoff Professor of Management of Technology, chaired an Industrial Liaison Program symposium entitled "Strategic Management of Technology: Global Benchmarking." An MOT reunion was scheduled with the event, commencing with a welcoming reception on December 9. Following the symposium there was an evening reception at the MIT Museum. On December 11, alumni/ae and current MOT students attended morning sessions with Sloan faculty, and concluded the reunion with a luncheon at the Faculty Club. Alumni/ae who were present included: **Mel Arnold**, SM '91, **Mike Beasley**, SM '91, **Steve Bello**, SM '88, **Andrew Blanchard**, SM '90, **William Culbert**, SM '86, **Ghaleb Daouk**, SM '91, **Mark Emery**, SM '91, **Antonio Flores**, SM '90, **Shingo Fukuda**, SM '92, **Joe Gilman**, SM '90, **Tom Greaves**, SM '90, **John Harrison**, SM '83 (I), **Tom Heller**, SM '91, **Audie Hittle**, SM '91, **Terry Leslie**, SM '86 (VI), **Akio Mitsufuji**, SM '89, **Todd Moore**, SM '91, **Gary Smolander**, SM '91, **Kip Stevely**, SM '90, **Barney Ussher**, SM '92, **Tony Weighous**, SM '89, **Ed Wong**, SM '91, **Roberta Zald**, SM '90, **Meir Zucker**, SM '89.

Jerome Sutton, SM '83, is executive director at the Aeronautical Systems Center at Wright-Patterson AFB in Ohio. He stopped by the MOT office in December while he was in the area on business. . . .

Glenn Nedwin, SM '87, president of Novo Nordisk Biotech, Inc., in Davis, Calif., announced the grand opening of this new company in September of 1992. Guests included **Mads Ovlsen**, CEO of Novo Nordisk A/S (Denmark); **Arthur Kornberg**, 1959 Nobel Laureate for discovery of the enzymatic synthesis of DNA; **Theodore Hullar**, U.C. Davis chancellor; and **Lois Wolk**, mayor of Davis. . . . **Meir Zucker**, SM '89, joined Optrotech, Inc., as sales and marketing manager in 1992. Optrotech is a \$70M high-tech company based in Israel with subsidiaries worldwide. . . . **Kip Stevely**, SM '90, is director of manufacturing at Rochester Operations for General Motors. . . . **Ghaleb Daouk**, SM '91, is a clinical and research fellow at Massachusetts General Hospital. Recently, he was invited to talk at an international symposium for Arab scientists abroad, held in Amman, Jordan, where he gave an overview of biotechnology and its diverse applications. At MGH he is both seeing patients and in the laboratory, where he developed a new assay to determine the function of an autoantibody in a disease of kidneys and lungs. . . . **Mark Taylor**, SM '91, is manager of materials research at Corning, Inc., in Corning, N.Y. . . . **Hidetaka (Tak) Kai**, SM '92, is an associate consultant at Arthur D. Little, Inc., in Japan.—**Fay Wallstrom**, MOT Program, MIT, Room E56-304, Cambridge, MA 02139.

XVI AERONAUTICS AND ASTRONAUTICS

Lieutenant Commander Gary A. Napert, SM '89, writes: "I work at the U.S. Coast Guard Aircraft Repair and Supply Center (ARSC) in Elizabeth City, N.C. I am chief of the Fixed Wing Branch within the Engineering Division. I am responsible for repairs, modification, and support of USCG fixed-wing aircraft. Primarily, 31 MC-130H aircraft and 41 HU-25 aircraft. The HU-25 is a military version of the Falcon Jet DA-20." . . . **Ross Jones**, SM '78, reports: "I am the supervisor of the NASA-Jet Propulsion Laboratory's Advanced Spacecraft System Concepts Group. We are responsible for the conceptual design of JPL's future spacecraft. My group and I are very busy creating concepts for microspacecraft to be used for planetary exploration through the year 2012." . . . **Karl Bergey**, SM '51, sends word: "I recently retired as professor of aerospace and mechanical engineering at the University of Oklahoma. I have been chair of Bergey Windpower for some years and am now also president of H&B Medical Technology, Inc., in Norman, Okla." . . . From Milton, Mass., **John Hovorka**, ScD '61, reports: "This records my semi-retirement to half-time teaching as a physics professor at Curry College, where I came in 1969 as science division chair. (No physics department; there are right now only four majors in a 900-student total). Prior to 1969, I served MIT as associate director for Space Sciences at the (also retired) Measurement Systems Laboratory in Aero and Astro. Now my chief alumni/ae connections with the Institute are the MIT Club of Boston and the Boston Seminars."

Peter M. Bainum, SM '60, writes from Bethesda, Md.: "I was initiated as a Fellow of the AIAA in April 1992, reelected VP of the International-American Astronautical Society in October 1992, and elected to the rank of Fellow in the American Association for the Advancement of Science in October 1992. The AAAS initiation ceremony was held at the AAAS Annual Meeting held during February in Boston." . . . General **James H. "Jimmy" Doolittle**, SM '24, ScD '25, has received another honor, this time from the NAE, which has named him a Distinguished Honoree for his service "to the advancement of aviation, engineering, and the nation's welfare." Doolittle is only the second person to gain that designation from the NAE. Perhaps best known for his exploits as a pilot and as the leader of a daring 1942 bombing raid on Tokyo during WWII, Doolittle, now 95 and living in Pebble Beach, Calif., also was a pioneering aircraft engineer. He received one of the first doctor of science degrees in aeronautical engineering in

the United States. His master's and doctoral research, on stress analysis and the effects of wind on aircraft performance, made an early contribution to the advancement of the safety and reliability of air transportation.



Paul Gibson

consultant for a series of high-priority projects that included acting as a weapons consultant on a team studying new launch techniques. From 1979–1985 he was lead scientist for NUSC's flat plate water tunnel. . . . **Lester W. Schmerr, Jr.**, '65, is one of three recipients of the the American Society for Non-destructive Testing's 1992 Achievement Award. The award is given to encourage a high degree of effort toward technical, educational, or managerial achievement in NDT and the reporting of such achievements through ASNT publications. Schmerr and coauthors won the award for their article "Neural Network Inversion of Uniform-Field Eddy Current Data," published in *Materials Evaluation* (January, 1991). Since 1970, Schmerr has been at Iowa State University, where he is currently professor of engineering science and mechanics and associate director of the Center for NDE. His research interests include ultrasonics, elastic wave propagation and scattering, and artificial intelligence.

XVII POLITICAL SCIENCE

Stephen Rosskamm Shalom, '70, is the author of *Imperial Alibis: Rationalizing U.S. Intervention After the Cold War* (1993, South End Press). "Many Americans hoped that the collapse of the 'evil empire' would lead to the end of the U.S. role as global cop. Stephen Shalom's *Imperial Alibis* reminds us that the Soviet threat was never more than an excuse for 'massive military spending, constant interventions abroad, and repression at home'—and that the new world order will simply prompt new 'alibis' for the same imperial behavior," states a publisher's release. Shalom teaches political science at William Paterson College in New Jersey, and is the author of *The United States and the Philippines*, and the editor of *Socialist Visions* and with Daniel Schirmer, *The Philippines Reader*. Shalom writes frequently on U.S. foreign policy for *Z Magazine*, *The Nation*, *Bulletin of Concerned Asian Scholars*, *Journal of Peace Research*, and *Pilipinas*.

Course VI Professor **Arvind** (his full name), an internationally known leader in computer languages for parallel computation based on dataflow principles, has been selected as the first to hold the Charles W. and Jennifer C. Johnson Professorship in Computer Science. A gift from Jennifer C. and **Charles W. Johnson**, '55, established the professorship in the Department of Electrical Engineering and Computer Science. Mr. Johnson is the founder of IMSL, Inc., of Houston. The Johnsons also support the Johnson Prize, given annually to an MIT undergraduate for outstanding performance on a thesis in computer science. From 1974–78, Arvind was an assistant professor at the University of California at Irvine, and visiting assistant professor at the Indian Institute of Technology in 1978, the year he joined MIT. He is a leader in addressing the fundamental issues of how to make computers more powerful by using the intrinsic parallelism in many physical applications.

XVIII MATHEMATICS

Warren Teitelman, SM '63, PhD '66, has been named VP for engineering at Lucid, Inc., in Menlo Park, Calif. . . . **Paul L. King**, PhD '73, has relocated to Vancouver, Wash. He writes: "I continue to be heartened and impressed by the quality of MIT education and research, and by the elucidation of these by your publications and *Technology Review*. Keep up the good work." . . . **James G. Simmonds**, '57, SM '58 (XVI), PhD '65, a professor at the University of Virginia at Charlottesville, has been named a Fellow of ASME. Simmonds teaches engineering and applied science at UVA and also chairs the Department of Applied Mathematics. He is a member of the American Academy of Mechanics and the AAAS, among others. . . . A book entitled **Invention: The Care and Feeding of Ideas** (MIT Press, 1993), by the late Professor Emeritus **Norbert Wiener** (1894–1964), has just been published. The celebrated mathematician and National Book Award Winner was at MIT from 1919–64, serving the last four as emeritus professor. Written in the 1950s, this engaging history of scientific innovation was recently discovered among Wiener's papers. "An engineer and inventor himself, Wiener cautioned against organizational patterns in scientific institutions which he felt were anathema to creativity. He also warned against R&D policies that bound researchers too tightly to a corporate bottom line. Observing that research is increasingly sponsored by large and intensely competitive companies that stand to reap enormous profits by keeping their discoveries secret, Wiener foresaw the costs of such policies, which do little to advance the cause of scientific endeavor or the well-being of humanity. This and other of his assessments remain strikingly pertinent to the scientific and technical landscape of our own day," states an MIT Press promotional letter.

The University of Salamanca in Spain has honored **Bertram Kostant**, Course XVIII professor, with the title Doctor Honoris Causa in recognition of his achievements in mathematics. It was conferred at a ceremony in Madrid, Spain. . . . A Midwest investor who had a lifelong interest in mathematics and a high regard for MIT has established through a trust the Robert E. Collins Mathematics Professorship Fund in the Department of Mathematics. The purpose of the fund is to provide faculty support in the department for a professor whose work reflects creative and innovative thinking and, eventually, to establish a chair. Collins, who died September 5, 1991, was not an alumnus of MIT and did not attend any other college or university. He was a very successful investor and his long interest in mathematics led him to an appreciation of the work in that field at MIT. The department, widely considered to among the top two or three best in the country, has 74 faculty members who teach and do research in both theoretical and applied mathematics. The international award in mathematics (a Nobel Prize is not given in this discipline) is the Fields Medal. Only 24 have been awarded in the last 45 years and two of these have gone to members of the MIT mathematics faculty. . . . In the October 1991 Course News, we incorrectly accented the name of **Diarmuid Ó Mathúna**, PhD '62, of Dublin, Ireland. Our apologies.—ed.

XX APPLIED BIOLOGICAL SCIENCES

From Greer, S.C., **Joseph Riemer**, PhD '77, writes: "I am manager of R&D in the Food and Consumer Products Group of CRSS, serving the food industry in process and facility engineering design." . . . **Irene Newsham**, PhD '89, reports: "I'm enjoying the sunny lifestyle of San Diego. Currently, I'm heading the Section of Human Carcinogenesis at the Ludwig Institute for Cancer Research—San Diego Branch and jointly working as an instructor at the School of Medicine at UCSD. When I'm not

working, I'm playing softball, volleyball, and figure skating." . . . **Eugene N. Bilenker**, PhD '56, sends word from Elizabeth, N.J.: "I am VP for corporate quality assurance and R&D at the Great Atlantic and Pacific Tea Co., Inc. This is a supermarket chain including A&P, Food Emporium, Waldbaum's, Farmer Jack, and Kohl's chains. In Canada, A&P and Dominion."

XXI HUMANITIES

Two MIT faculty members in the music and theater arts section have been chosen as ASCAP Award recipients for 1992–93. They are **David M. Epstein**, professor of music, conductor of the MIT Symphony Orchestra, and a widely known pianist, composer, and conductor; and **Evan Ziporyn**, assistant professor of music and noted jazz saxophonist. The American Society of Composers, Authors, and Publishers makes the cash awards to assist and encourage writers of serious music. They are granted by an independent panel, based on the "unique prestige value of each writer's catalog of original compositions as well as recent performance activity of those works." . . . Ziporyn has been recognized with two other honors—he is the recipient of the 1992 Wade Award, and the Class of 1958 Career Development Professorship. Ziporyn is a composer and clarinetist whose work has been critically acclaimed on four continents. Recipients of the Wade Award receive a \$30,000 grant, which has been given annually since 1985 to a junior faculty member to support his or her research or other creative projects. Ziporyn is the first School of Humanities and Social Science faculty member to receive the award. The grant will be used to support his scholarly activities and to help produce his full-length opera based on the life of the seventeenth century mystic, Sabbatai Sevi. Last July, Ziporyn was appointed the Class of 1958 Career Development Professor, a chair established to recognize and encourage innovative and imaginative teaching by junior faculty members who show exceptional promise. Since 1980, Ziporyn has divided his time equally to new music, jazz, and Balinese music, attempting in his own work to bring all these traditions together in a meaningful synthesis. He had made several extended trips to Bali, Southeast Asia, and Africa, performing, teaching, and studying. In 1987 he received a Fulbright Fellowship for his studies in Balinese music.

The School of Humanities announced the receipt of a \$1 million gift from Kenneth Fang, SM '61 (X), of Hong Kong. The gift will be used to create an endowment named after Fang's father, S.C. Fang, to support the Chinese Language Program within the school's Foreign Languages and Literatures Section. Fang is managing director and co-owner of Fang Brothers Knitting Ltd., which produces and markets clothes throughout the world. Born in Shanghai, Fang left China with his family for Hong Kong in 1949. He holds the Order of the British Empire and has twice served as VP of the MIT Club of Hong Kong.

XXII NUCLEAR ENGINEERING

Sadik Kakac, SM '59 (II), SM '60, who is in the Department of Mechanical Engineering at the University of Miami in Coral Gables, Fla., writes: "I am organizing a NATO Advanced Study Institute on Electronic Cooling and am the director of the institute. The meeting will be held in Turkey June 21–July 2, 1993." . . . **Steven B. Goldman**, SM '78, writes: "I established Technology & Management Planning Associates, Inc. We provide corporations with emergency planning and management, crisis communications, and media relations services." . . . **Lieutenant Mather K. Waltrip**, SM '89 (II), SM '89, reports: "Finishing up my tour at Mare Island Naval Shipyard. Planning to leave the Navy this

year and start a new career as a consultant or sales engineer in the San Francisco Bay area." ... **John S. Machuzak**, SM '85, PhD '90, sends word: "I completed a post-doctorate at the MIT Plasma Fusion Center from June 1990-June 1992. Was a visiting scientist at the Joint European Torus in Abingdon, England from June 1991-March 1992. Worked as a visiting scientist at the Tokamak Fusion Test Reactor (TFTR) in the Princeton Plasma Physics Laboratory in New Jersey, from March 1992 to the present. Transitioned to experimental research scientist at the MIT Plasma Fusion Center in June 1992."

Reverend **Donald H. Stevens**, SM '62, writes: "I worked as a nuclear safety consultant from July to November 1992, to the Indonesian government in Jakarta in the design of proposed nuclear power plants." ... Word from **Samuel S. Jabbawy**, SM '75, NUE '75: "I am the president and founder of NES Technologies, Inc., in Easton, Mass. NES specializes in contract electronics manufacturing. I reside in Newton with my wife, Carole, and our three sons." ... **George Yadigaroglu**, ScD '70, who is teaching at the Swiss Federal Institute of Technology in Zurich, Switzerland, is spending a sabbatical semester (September 1992-March 1993) at the University of California at Berkeley. In addition, Yadigaroglu has been named a Fellow of the ASME. ... Contributions to the methodology of safety assessment of nuclear power reactors have won yet another award for Course XXII Professor **Norman Rasmussen**, PhD '56 (VIII). He is sharing the 1992 Walter Ahlström Prize with Antti Vuorinen of Finland. Rasmussen directed the first major study in the United States that introduced probabilistic risk in evaluation of nuclear reactor safety. Since then, the methodology has been applied worldwide to study safety improvements in the operation of nuclear power reactors.

XXIV LINGUISTICS AND PHILOSOPHY

Wah-Chun Mary Kim, PhD '76, sends word from Potomac, Md.: "I am currently supervising the Japanese and Korean programs at the Foreign Service Institute at the Department of State." ... **Noam Chomsky**, MIT professor of linguistics, was recently named one of nine recipients of the 1992 Lannon Literary Awards and Fellowships, worth \$40,000 each. These awards recognize both experienced and new writers who have made "significant contributions to English-language literature." ... **Frances Myrna Kamm**, PhD '80, has written *Creation and Abortion* (Oxford University Press, 1992).

TPP TECHNOLOGY AND POLICY PROGRAM

Gary Lantner, '72 (XVI), SM '72 (I), is continuing his airline career. He has been appointed head of the Facilities Planning and Engineering Department of United Airlines, having headed similar departments at Republic Airlines, Eastern Airlines, and Continental Airlines. ... **Brian Mella**, SM '78, is a "CPU Evangelist"—a national sales rep for Apple Technologies. ... **Jonathan Weiss**, '76 (I), '77 (XVII), SM '78, has a two-month assignment in Russia to help retrain workers. ... **Dan Saltzman**, SM '80, has been elected county commissioner for Portland, Ore. Congratulations! ... **Olivier De Botton**, SM '88, is the director of Worldwide Cartier Boutique Development. He has been with the company for more than two years. ... **Jennifer Croissant**, SM '89, is a doctoral candidate and adjunct lecturer at RPI's Science Technology Studies Department. She is also coaching the women's varsity track team and gymnastics club. Last August, Jennifer presented a paper at the Society for the Social Study of Science in Göteborg, Sweden. ... **Daniel Greenberg**, SM '90, has been an analyst for the Massachusetts Department of Public Utilities since November 1990. His primary responsibilities include reviewing utility energy conservation pro-

grams and advising the commission on utility resource procurement. ... **Mark Roberts**, SM '90, is completing work on an Office of Technology Assessment study of defense conversion that is due out in the Spring of 1993. He visited both Thailand and Singapore last summer and is currently learning sculpture at the Corcoran School of Art. ... **Michael Berube**, '89 (I), SM '92 (XV), SM '92, is currently living in Birmingham, Mich., and working at Chrysler Corp. He is an environmental planning specialist and is working on energy and alternative fuel vehicle strategy. Mike recently spent a week in the British West Indies and "ran into" Sam Druker, '90 (V), and Anna Cinniger, SM '91 (XVI), who were on their honeymoon. It's a small world! ... **Ross McNutt**, SM '92 (XVI), SM '92, is a satellite engineer (with a difference) for the Global Positioning Satellite System at Falcon Air Force Base in Colorado Springs, Colo. Ross and Stacy are expecting their first child in March and are looking forward to becoming parents. If you are in the area, please give them a call.—Richard de Neufville, TPP, MIT, Room E40-252, Cambridge, MA 02139.

Deceased

The following deaths have been reported to the Alumni/ae Association since the *Review* last went to press:

Marie C. Turner, '09; February 26, 1976; Oak Bluffs, Mass.
George F. DesMarais, '20; November 17, 1992; Norton, Ohio
Edwin B. Murdough, '20; November 10, 1992; South Acton, Mass.
Elizabeth T. Shepard, '21; October 16, 1992; Dayville, Conn.
Benjamin F. Williams, '21; October 8, 1992; Silver Spring, Md.
Saul J. Copellman, '22; November 9, 1992; West Palm Beach, Fla.
George W. Dakin, '22; November 15, 1992; Franklin, N.H.
Hiram H. Maxim, '22; November 2, 1992; Old Lyme, Conn.
Edwin C. Lindstrom, '24; June 29, 1991; Vernon Rockville, Conn.
Edwin E. Kusmaul, '25, SM '26; September 23, 1992; Boynton Beach, Fla.
William E.P. Doelger, '26, SM '27; November 12, 1992; West Palm Beach, Fla.
Ralph A. Waugh, '26; October 26, 1992; Newmarket, N.H.
Arthur O. Gormley, '27; May 26, 1992; Fairfax, Va.
Samuel Pearlman, '27; June 1, 1992; Miami, Fla.
Richard S. Carroll, '28; November 13, 1992; Enfield, Conn.
Arthur R. Elliott, '28, SM '29; Newport News, Va.
George H. Flynn, '28; October 17, 1992; Tequesta, Fla.
Truman S. Gray, SM '29, ScD '30; November 7, 1992; Lexington, Mass.
Stuart M. Barnette, '29; November 5, 1992; Jacksonville, Fla.
Emer Takeo Morimoto, '29; October 10, 1992; Kyoto City, Japan
Robert T. Armstrong, '30, PhD '35; July 14, 1992; East Dorset, Vt.
Donald C. Harrison, '30, SM '31; December 2, 1992; Roxbury, Conn.
Robert J. McMinn, '31; September 2, 1992; Cocoa, Fla.
David G. Smith, '31, SM '32; Lexington, Ky.
Arthur La Capria, '32; September 15, 1992; Laurel, Md.
F. Curtis Tucker, Sr., '32; November 7, 1992; Upper Arlington, Ohio
William E. Barbour, Jr., '33; November 15, 1992; Concord, Mass.
Dayton H. Clewell, '33, PhD '36; November 11, 1992; La Canada, Calif.
George Russell Eddy, '33; October 29, 1992; Manlius, N.Y.
Edward R. Loftus, '33; November 4, 1992

Charles W. MacMillan, '33; September 13, 1992; Rock Island, Ill.
John D. Tyson, SM '33; July 12, 1989; Tarpon Springs, Fla.
Edward Donald Winkler, '33; October 20, 1992; Grafton, Mass.
Harry E. Heiligenthal, '34; March 15, 1992; Willoughby, Ohio
George P. Sweeney, Jr., '34; October 14, 1992; Silver Spring, Md.
Eva A. Disharoon, SM '35; April 10, 1984; Pepperell, Mass.
Gale Forssen, '35; May 27, 1992; Omaha, Neb.
Frederick F. O'Brien, '35; October 29, 1992
Ira I. Hochberg, '36; June 2, 1991; Watertown, Mass.
Bernard S. Schulman, '36; May 14, 1984; Pompano Beach, Fla.
Donald C. Thompson, '36; October 10, 1992; Winter Harbor, Me.
Leonard F. Dowding, '38, SM '39; January 5, 1992; Williamsport, Md.
Francis A. Fisher, '38; May 30, 1992; Orleans, Mass.
Anne S. Mowat, '33; November 11, 1992; Hyannis, Mass.
Ellery W. Niles, SM '38; July 11, 1992; Albuquerque, N.M.
James J. Spartales, '38; September 17, 1992
Joseph Gilbert Hooley, PhD '39; June 25, 1987; Vancouver, B.C., Canada
John W. Wilson, Jr., '37; May 30, 1992; Cherry Hill, N.J.
Robert L. Green, ScD '40; September 28, 1991; Cherry Hill, N.J.
Leonidas A. Keches, '40; November 9, 1992; New Bedford, Mass.
Francis L. Lee, SM '40; January, 1985; Whittier, Calif.
Stanley C. Snowdon, '40; November 4, 1992; Wheaton, Ill.
Donald G. Jordan, SM '41; May 3, 1992; Reno, Nev.
Douglas Watson, '41; October 29, 1992
Richard P. Little, '42; November 7, 1992; Saint Albans, W.V.
John W. Sheetz, III, '42; SM '47; November 18, 1992; Belmont, Mass.
Robert H. Barnaby, '44; November 12, 1992; Cotuit, Mass.
Kevin T. Maroney, '44; January 9, 1985; Silver Spring, Md.
Arthur B. Engel, SM '45; November 10, 1992; Palm City, Fla.
Donald P. Strang, '45; October 15, 1992; Cape May Point, N.J.
Sears Y. Coker, '47; May 22, 1992; Alexandria, Va.
Hugh S. Graham, ScD '47; October 7, 1992; Prescott, Ariz.
Alexander Bagdassarian, '48; October 14, 1992; Belmont, Mass.
Charles I. Beard, PhD '48; July 9, 1991; Mercer Island, Wash.
Randall K. Cleworth, '49; April 15, 1992; Hinsdale, Ill.
David H. Carlton, Jr., '51; November 18, 1992; Wilmington, Del.
John M. Clegg, '51; January, 1989; Key West, Fla.
Edwin M. Harnisch, '51; November 2, 1992
John Napier, '51; February 25, 1992; Poughquag, N.Y.
Harold C. Schweinler, PhD '51; August 25, 1990; Rockwood, Tenn.
Richard L. Warfield, '51; June 22, 1992; Midland, Tex.
Henry H. Cross, '52; June 30, 1990; Needham, Mass.
Thomas L. Moran, NE '52; July 8, 1991; Kensington, Md.
Gabriel G. Pitta, '53; September 29, 1991; Santa Monica, Calif.
Keith Williams, MAR '53; October 22, 1991; Winchester, Va.
Jules R. Byron, '57; April 26, 1992; Port Washington, N.Y.
Charles A. Martin, '62; November 5, 1992; Milford, Mass.
James E. Fanning, SM '63, PhD '64; October 13, 1992; Madison, N.J.
William S. Goldberg, '63; October 12, 1989; Morrisville, Pa.
Gary L. Greeson, MCP '65; June 2, 1991; Ormond Beach, Fla.

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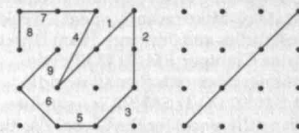
PUZZLE CORNER

Continued from page MIT 55

drawn from the free end of a previously drawn line. All lines must be straight and start and end at a dot. A line may connect more than two dots if all are in a straight line. No line shall be drawn to a previously connected dot or cross another line.

The second diagram shows a game in progress where the first player has drawn his first line along a long diagonal of the field. Is this a winning or a losing move? There can be no ties.

Sheldon asserts that the long diagonal is a winning move and writes:



GAME LOST BY FIRST PLAYER GAME IN PROGRESS

Consider the points in the matrix numbered (in hexadecimal notation) as follows:

C	D	E	F
8	9	A	B
4	5	6	7
0	1	2	3

After White's first move, assume Black plays from 0 to a point in the lower right half. For every Black play, except 0>B, White has a winning play into the same half. Therefore Black's first move is forced: 0>B. The half-court winning plays are as follows:

```

White : Black : White : Black : White : Black : White : Black :
0 > F : 0 > 1 : F > 2 : 1 > 6 : 2 > 7 : 7 > 3 : Wins
          : 2 > 3 : 3 > B : 1 > 6 : Wins
          : 2 > 6 : Wins
          : 2 > 7 : 7 > 3 : 1 > 6 : Wins
          : 2 > B : B > 3 : 1 > 6 : Wins
          : * > 6 : Wins (* = either way)
0 > F : 0 > 2 : F > 3 : * > 6 : Wins
0 > F : 0 > 3 : F > 7 : 6 > 1 : 1 > 2 : * > 3 : Wins
0 > F : 0 > 6 : F > 7 : 6 > 2 : 7 > 3 : 2 > 1 : Wins
          : 6 > 3 : 3 > 2 : 2 > 1 : Wins
          : 7 > 3 : Wins (mirror of above 6 moves)
0 > F : 0 > 7 : F > B : B > 6 : 7 > 2 : 2 > * : Wins
          : 7 > 1 : 1 > 3 : B > 6 : Wins
          : 7 > 2 : 2 > 1 : B > 6 : Wins
          : 7 > 3 : 3 > 1 : B > 6 : Wins
0 > F : 0 > B : Forced move for Black.
  
```

Black's forced move creates two independent half-court games. In line with the old NIM philosophy of matching moves until the end we will assume that white makes a symmetrical game by playing F>4, which since the games are independent can be treated as a 0>B move, and for convenience, both will be treated as 0>1 moves. The resulting 5 point games will start:

```

Five Point Game:
1 > 2 > 3 > 6 > * > * : (mirror of 1 2 3 6)
1 > 2 > 3 > B > 6 :
1 > 2 > 6 > 3 > 7 > B :
1 > 2 > 6 > 3 > B :
1 > 2 > 6 > 7 > * :
1 > 2 > 6 > B (mirror of 1 2 6 3)
1 > 2 > 7 > B :
1 > 2 > 7 > B (mirror of 1 2 7 6)
1 > 2 > B > 3 :
1 > 2 > B > 6 :
1 > 2 > B > 7 > 3 :
1 > 3 > 6 > 7 > * (mirror of 1 3 6)
1 > 3 > B > 6 :
1 > 6 > 7 > 3 : (mirror of 1 2-->)
1 > 7 > * > * :
1 > B (mirror of 1 3-->)
  
```

Removing mirror image entries, we obtain (the even-odd parity includes 0>1, but not 0>F):

```

1 > 2 > 3 > 6 > * > * : Even
6 > 3 > 7 > B : Odd
6 > 3 > B : Odd
6 > 7 > * : Odd
7 > 3 : Even
7 > 6 > B : Odd
B > 3 : Even
B > 6 : Even
B > 7 > 3 : Odd

1 > 3 > 6 > * > * : Odd
B > 6 : Even
1 > 7 > * > * : Even
  
```

For a White win, one "game" must be played even and the other odd.

If Black plays 1>3 in one half, White plays 1>3 in the other. Black then must choose 6 or B (Odd or Even) in one half, and White plays opposite for Even/Odd and a win.

If Black plays 1>7 or 1>2 in one half, White plays 1>2 or 1>7 in the other. The Even game is a wash, and the situation reduces to a single game with Black selecting 3,6,7 or B from the following board:

```

1 > 2 > 3 > 6 > * > * : Even
B > 6 : Odd
6 > 3 > 7 > B : Even
3 > B : Odd
7 > * : Odd
7 > 3 : Even
6 > B : Odd
B > 3 : Even
6 : Even
7 > 3 : Odd
  
```

```

If Black 2 > 3, White 3 > B Wins.
If Black 2 > 6, White 6 > 7 Wins.
If Black 2 > 7, White 7 > 6 Wins.
If Black 2 > B, White B > 7 Wins.
  
```

The above shows that White has a forced win for all legal moves by Black. Therefore the answer is that playing the major diagonal is a winning first move.

Other Responders: Responses have also been received from M. Astelfi, R. Hess, E. Kaplan, J. Keilin, A. Mullin, J. Preston, E. Sard, S. Shaffer, T. Shepard, R. Stanley, K. Turkewitz, and D. Ullery.

Proposer's Solution to Speed Problem: 12,600 fps.

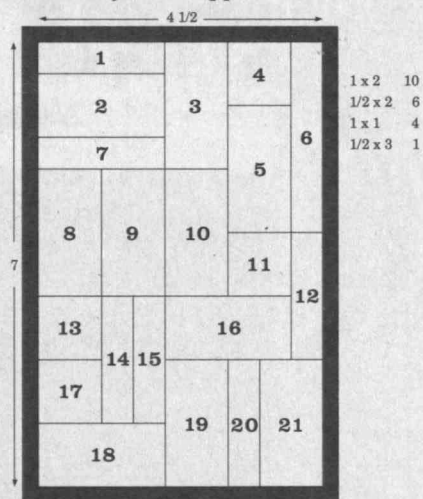
Tackling the Blocks

It has been a year since I specified the size of the backlogs for the various kinds of problems that are printed; let me do so now. I have about a two-year supply of regular problems, and close to a year of chess, bridge, and speed problems; computer problems are in short supply.

Problems

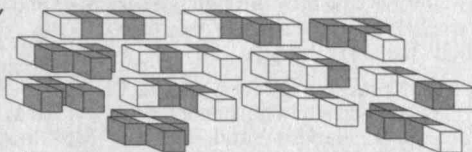
APR 1. Our first offering is a chess/timber problem from Winslow Hartford, who begins by pointing out that a closed knight's tour is important for timber companies since it gives a pattern for cutting sections of a forest so that successive cuts are not on adjacent land. Even better would be a closed tour of a "superknight" that moves 3 squares in one direction and 2 in the other (instead of the usual 2 and 1). The smallest chessboard containing a closed knight's tour is a 6x6. What is the smallest chess board containing a closed superknight's tour?

APR 2. Samuel Gluss has a set of blocks that fits nicely into a wooden box as shown below. His father, David, notes that there are many ways to pack the pieces into the box and wants you to find one with the $1/2 \times 3$ piece (#6) placed horizontally in the upper left corner.



SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO ALLAN J. GOTTLIEB, '67, THE COURANT INSTITUTE, NEW YORK UNIVERSITY, 251 MERCER ST., NEW YORK, N.Y. 10012, OR TO: GOTTLIEB@NYU.EDU

APR 3. Nob Yoshigahara wants you to pile up the 12 pentacubes shown into a $3 \times 4 \times 5$ solid. Nob adds that the solution is unique up to mirror image.



Speed Department

Phil Bonomo offers one for the "space cadets." Circular orbital speed for the synchronous (24-hour period) class of communications satellites is about 10,000 fps. Without consulting a table of physical constants, what is the circular orbital speed for the sub-synchronous (12-hour period) class of navigation satellites?

Solutions

N/D 1. We begin with a computer-related problem that Max Hailperin heard from Albert Faessler. A primitive Pythagorean triple (PPT) is a triple of positive integers (a, b, c) such that $a^2 + b^2 = c^2$ and a, b , and c have no common factor (this last condition is what makes the triple "primitive"). The area of a PPT is $ab/2$. Euler found that the smallest area shared by three PPTs is 13123110. What is the next smallest area shared by three PPTs?

I suspect this problem is far from trivial. Only the proposer sent a solution, namely 2203385574390, which is shared by the three PPTs: (376420, 11707059, 11713109), (403332, 10925915, 10933357), and (1082620, 4070469, 4211981). He has sent a copy of his program. Due to space considerations we are printing only the introductory comment, which gives the method. Readers wishing the actual code should send a letter to Faith Hruby at *Technology Review*.

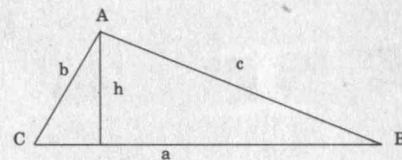
It has been known at least since Euclid that the PPTs (x, y, z) described above are in one-to-one correspondence with the "generator" pairs (a, b) with $\gcd(a, b) = 1$, $(a+b) \pmod{2} = 1$, and $a > b$. (Let $x = 2ab$, $y = a^2 - b^2$, $z = a^2 + b^2$.) The area of a PPT in terms of its generator pair is $f(a, b) = ab(a-b)/(a+b)$.

The approach taken is to enumerate pairs of numbers in order of increasing f -value, with an eye out for consecutive sequences of pairs that have equal f -values. The way the pairs are enumerated in increasing f -value order is by using a change of variables $d = a - b$ to re-express the problem in terms of $f(b, d) = bd(b+d)/(2b+d)$ which is monotonic in both b and d . (The restrictions are now that d must be odd and b and d relatively prime.) Since this rewritten f is monotonic in b and d , we know that at any given point in the enumeration, the next pair must either be an already used b -value together with the next-higher d -value than it was used with, or $(bcount+1, 1)$ where $bcount$ is the number of distinct b -values which have been used so far in the enumeration. A heap priority queue is used to keep track of

which of these various possibilities is in fact next in the enumeration order, and Euclid's algorithm for the greatest common denominator is used to test for relative primality. The f -values are represented as double-precision floating point numbers, rather than unsigned integers, because 32 bits isn't enough, but 53 is.

N/D 2. Gordon Rice wants you to find (non-equilateral) triangles containing a 60° angle. How about a 30° angle?

The following solution is from Matthew Fountain: The triangle with sides $a=8$, $b=3$, and $c=7$ has a 60° angle between a and b . No triangle with integer sides contains a 30° angle. Let a and b be the sides of a triangle ABC with $C=60^\circ$ and $a > b$. Altitude h , perpendicular to a , is of length $(b \sin(60^\circ)) = (b)(3/4)^{1/2}$ and meets side a at distance $b/2$ from C . The area enclosed by h, c , and part of a is a right triangle with sides of length h, c , and $(a-b)/2$. Let $d = a - b/2$. Then $c^2 - d^2 = h^2 = (3/4)b^2$. Setting $X = c - d$, and solving we obtain $c = 3b^2/8X + X/2$, and $d = 3b^2/8X - X/2$. We now can select values for b and X that produce an integer c . Then $a = d + b/2$ is also an integer. For example, when $X=2$, $b=4$ produces $c=4$ and $a=4$, $b=8$ produces $c=13$ and $a=15$, $b=12$ produces $c=28$ and $a=32$. The formula $c^2 = a^2 + b^2 - (2ab) \cos(C)$ may be used to check these values. The same formula shows that c cannot be an integer when $\cos(C) = (3/4)^{1/2}$.



N/D 3. Tom Harriman wonders for what values of X does the following "infinite exponential" converge.

$$X + X^{X^{X^{\dots}}}$$

Tricky! $X=-1$ clearly works and $X > e^{1/e}$ diverges but the exact answer is not so easy. $X=-1$ is the only negative answer. The non-negative solutions are

$$(1/e)^e \leq X \leq e^{(1/e)}$$

In particular, $0 < X < (1/e)^e$ does not work. Instead, as noted by G. Blondin, for such X , the exponential converges to oscillation between A and B , where $X^A = B$ and $X^B = A$, with

$$X < A < 1/e < B < 1.$$

Better Late Than Never

Jul 2. Oops!! The solution method given in Nov/Dec guarantees a loss, not a win. Below is a correct solution from Ed Sheldon, who remarks that overlooking this error must have been due to my close encounter with Hurricane Andrew. The problem was as follows:

Matthew Fountain suggests we tackle the "hold that line" problem devised by Sid Sackson and appearing in his book *A Gamet of Games*.

"Hold That Line" is a game in which two players alternate drawing straight lines between dots on a 4×4 dot field. The player to draw the last line loses. The first diagram shows a game in which the lines are numbered in the order they were drawn. Restrictions are that lines after the first shall only be

Continued on page MIT 54

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PROFESSOR AND MRS. KENNETH R. WADLEIGH

HOME: Swansea, Massachusetts

CAREER: When Professor Wadleigh (ME '43) left the Navy at the end of World War II, he decided to return to MIT for a doctorate and then go into industry. By the time he completed his degree, however, he had joined the faculty and was fully committed to teaching and research — and to MIT. He received the first Goodwin Medal, awarded for "conspicuously effective teaching," in 1953 and served as dean of student affairs from 1961 to 1969.

From 1969 to 1983 he was vice president and, in addition, from 1976 to 1983, dean of the Graduate School.

He takes pride in the successes of so many of his students and derives great satisfaction from his role in the development of the undergraduate residential programs, the MIT Medical Department, which provides care to over 30,000 patients, and the MIT Health Plan, which serves nearly 8,000. "Finally, helping MIT through the turmoil of the 1960s and the early 1970s was no small challenge," he says.

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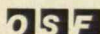
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Keeping the O

TO PREVENT ANOTHER *EXXON VALDEZ* ACCIDENT,
POLICIES MUST NOT ONLY ENCOMPASS THE ENTIRE
OIL-TRANSPORT SYSTEM BUT RECOGNIZE THE
INEVITABLE CONNECTION BETWEEN
OIL USE AND CATASTROPHIC SPILLS.

Oceans Oil-Free

By JUDITH TEGGER KILDOW



DESPITE public expectations that business would not proceed as usual after the *Exxon Valdez* accident, old politics continue to thwart efforts to develop new strategies and technologies for improving the safety of oil transport. The recent spills off the Spanish coast and the Shetland Islands provided further evidence that the international oil-transport system has not cleaned up its act.

When the *Valdez* ran aground on Bligh Reef in Alaska's Prince William Sound three years ago, it created an oil spill that, although neither the largest nor the most expensive to clean up, violated an unusually pristine area. News programs were filled with images of oil-soaked birds flopping pitifully on blackened beaches and seals and otters drifting lifeless in oil-thickened seas. Members of Congress received heavy mail.

They responded by passing the Oil Pollution Act (OPA), signed by the president on August 18, 1990, less than 17 months after the spill—a remarkably fast pace for a major piece of legislation. The bill had something for everyone. OPA mandated better navigational equipment on board ships and in ports, double hulls on oil tankers, and improved cleanup technologies and strategies. The law created R&D programs to support these mandates and provided for better licensing procedures, training programs, and contingency planning. OPA also instituted a management system that distributes authority over oil transport among many government agencies, although the secretary of transportation retains the last word on most matters. Perhaps most significantly, the act raised shippers' liability limits substantially.

OPA thus seemed to address most of the problems that have long plagued oil transport. But unfortunately, although OPA's provisions, if implemented, might prevent most small tanker spills, the act does not confront the problems associated with catastrophic spills like that from the *Exxon Valdez*. And some of the legislation's provisions may actually be counterproductive to their intended goals. Meanwhile the federal government has yet to appropriate any new funds even though OPA authorized \$60 million to establish a system for responding to oil spills, \$25 million a year for Coast Guard operations, \$27 million a year for R&D, and \$23 million to be spent over 10 years to clean up Prince William Sound.

This failure to follow through raises questions about

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the government's commitment to preventing oil spills, although preliminary activities have occurred on some fronts. For example, new government offices such as the National Pollution Fund Center as well as an interagency task force for R&D have been established, and committees have recently submitted reports on how funds for various OPA programs should be spent. But lack of central leadership is still the fundamental problem of oil transport: a diffuse set of congressional committees and executive agencies is charged with overseeing the system.

Without managerial leadership, we will fail to deliver navigation techniques that make transit safer, ships

that won't rupture should an accident occur, equipment that will contain spilled oil, and effective techniques for cleaning up oil that escapes containment. OPA does attempt to address some of these needs, but as time passes and little of substance occurs, both the memory of the *Exxon Valdez* and the pressure to act are fading.

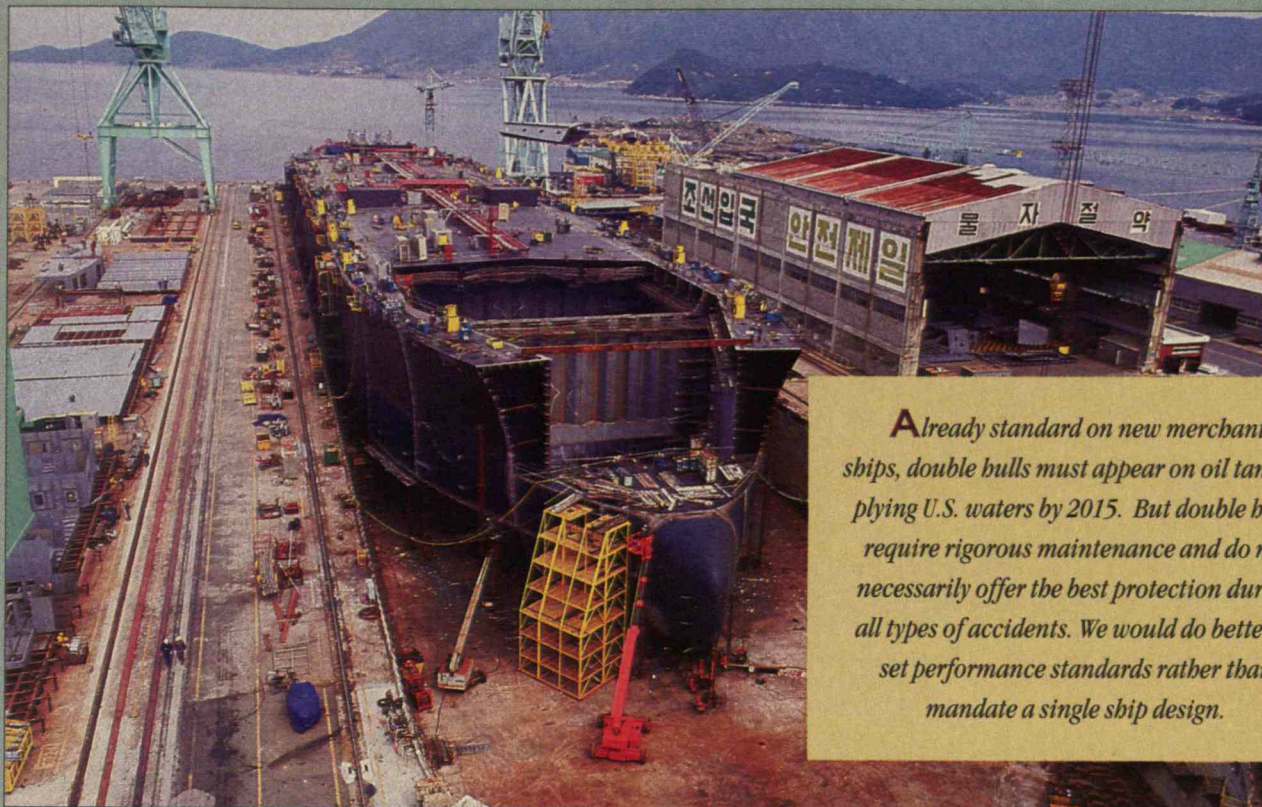
The Shape of Ships to Come

OPA requires that, by 2015, all tankers plying U.S. waters have double hulls. In a grounding or collision, the outer hull is supposed to take the shock while the inner hull remains intact. Double skins of one sort or another are already standard on most new merchant ships *except* tankers, and have been required for carriers of liquefied natural gas and similar hazardous cargoes for some time. But while the double-hull requirement—the centerpiece of the OPA—sounds like a good solution, there is a downside: selecting a fixed technology will likely stifle development and use of other designs that could make ship ruptures even less likely.

Though offering more protection than single hulls, double hulls require rigorous preventive maintenance. Special coatings that inhibit corrosion on new lighter, higher-tensile steels must be inspected regularly—in cramped confines and on both sides of the double skins. Building ships with two hulls is also costly and time-consuming, and shippers will undoubtedly try to squeeze more miles from conventional tankers until they must be scrapped or retrofitted by 2015. The result may be an aging fleet and growing danger of accidents—with less than half the fleet double-hulled during the next decade.

Because more than 90 percent of oil spills from ruptured hulls occur when ships run aground, an easier and less expensive alternative would be simply to add a second bottom to each tanker. Double bottoms would not

JUDITH TEGGER KILDOW is associate professor of ocean policy at MIT and a recent member of the National Academy of Engineering's Marine Board.



Already standard on new merchant ships, double hulls must appear on oil tankers plying U.S. waters by 2015. But double hulls require rigorous maintenance and do not necessarily offer the best protection during all types of accidents. We would do better to set performance standards rather than mandate a single ship design.

cut into cargo capacity as much as complete second hulls, and ship owners might install them more readily. But careful maintenance would still be required with this design, and the public would undoubtedly react skeptically to any attempts to modify OPA to allow them, particularly if another 10 percent risk of spills from collisions accompanied the changes.

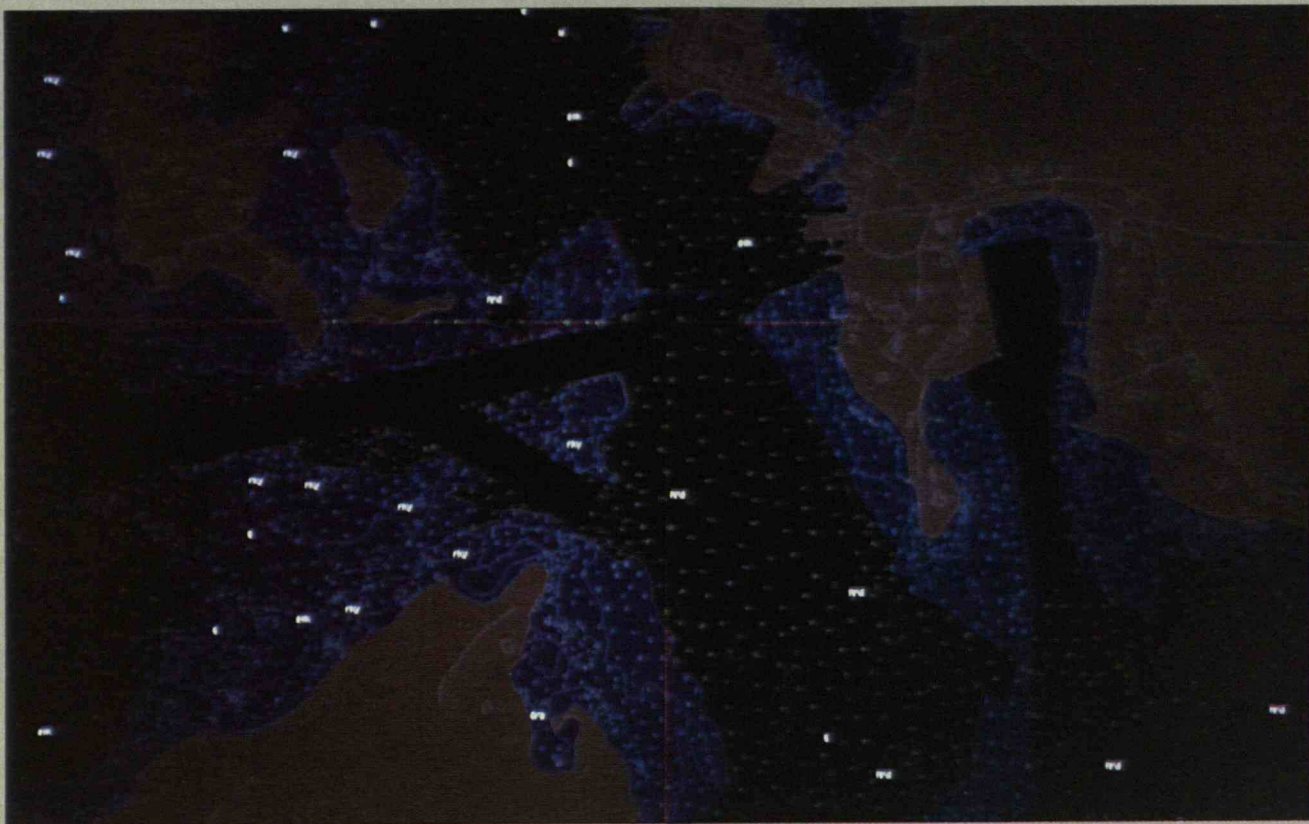
A more significant challenge to double hulls—the “intermediate-deck” design—is now being endorsed by nations adhering to the International Marine Pollution Convention, of which the United States is a signatory. The mid-deck concept is simple and not particularly new. A horizontal oil-tight barrier divides the cargo space into two parts. In the event of a rupture, the pressure of seawater against the ship would be greater than the oil pressure in the lower ruptured tank, thus preventing oil from leaking out. Some oil would be sucked out by the ship’s speed or currents, and some would ooze out as wave and tide action rocked a grounded ship, but under calm seas less than 2 percent of the lower tank’s cargo would probably be lost. As designed by Mitsubishi Heavy Industries, the mid-deck also has double sides so that water can be added to empty vessels for better stability. This ballast space, wider than in the double-hull design and therefore easier to inspect, would provide further protection in the event of a spill.

Preliminary testing in Japan has shown that the mid-

deck design would perform better than a double hull when a loaded tanker moving in calm waters at high speed strikes a fixed object, as happened with the *Exxon Valdez*. Rough waters bring the protection probabilities of the two designs closer. On the other hand, double hulls would probably provide more protection against smaller spills resulting from low-speed impacts in a port or harbor, since only the outer skin would be breached. Although OPA applies only in U.S. waters, the act was expected to prompt all tanker owners to order double-hull designs because of the large size of the U.S. market. But enormous international pressure is weighing on the United States to change its legislation and accommodate the “mid-deck” design.

Since it is easier to clean up smaller spills, it would seem logical to allow the mid-deck design, internationally endorsed as a better defense against major spills. But members of Congress who worry about legislating a “Japanese design” are already opposing such a change. (Ironically, a U.S. tanker owner, Charles S. Conway, received one of the earliest patents for a mid-deck design more than a decade ago.) The final decision should be made according to vessel performance and the likelihood of high-speed versus low-speed accidents in calm and rough waters—not in response to political considerations.

Also needed are incentives for shippers to more read-



ily accept new technologies rather than oppose them. Tax deductions, lower insurance premiums, and other inducements might make change more palatable and overcome a sluggish commitment to the status quo.

Rather than selecting a single ship design, legislation would ideally set performance standards and encourage innovations to meet them. It hardly seems useful to debate specific designs every time a promising new idea appears on the horizon—or another disaster occurs, as experience with the 1976 *Argo Merchant* spill showed. When President Carter called for double bottoms after that 7 million-gallon accident, industry experts testified in endless contentious hearings that oil could form an explosive vapor between the two skins, and that water filling the cavity might capsize these ships. The record has not supported these arguments (and inert gases are sometimes added to these spaces to prevent explosions).

Unfortunately, the information to set performance standards is not available, since R&D on “crash worthiness,” highly successful in the automobile and aircraft industries, has not been common practice in shipbuilding—designs have traditionally been determined by their behavior under normal conditions. Congress therefore needs to fund research on vessel performance during groundings and collisions, shifting its legislative approach to standard setting when enough information becomes available.

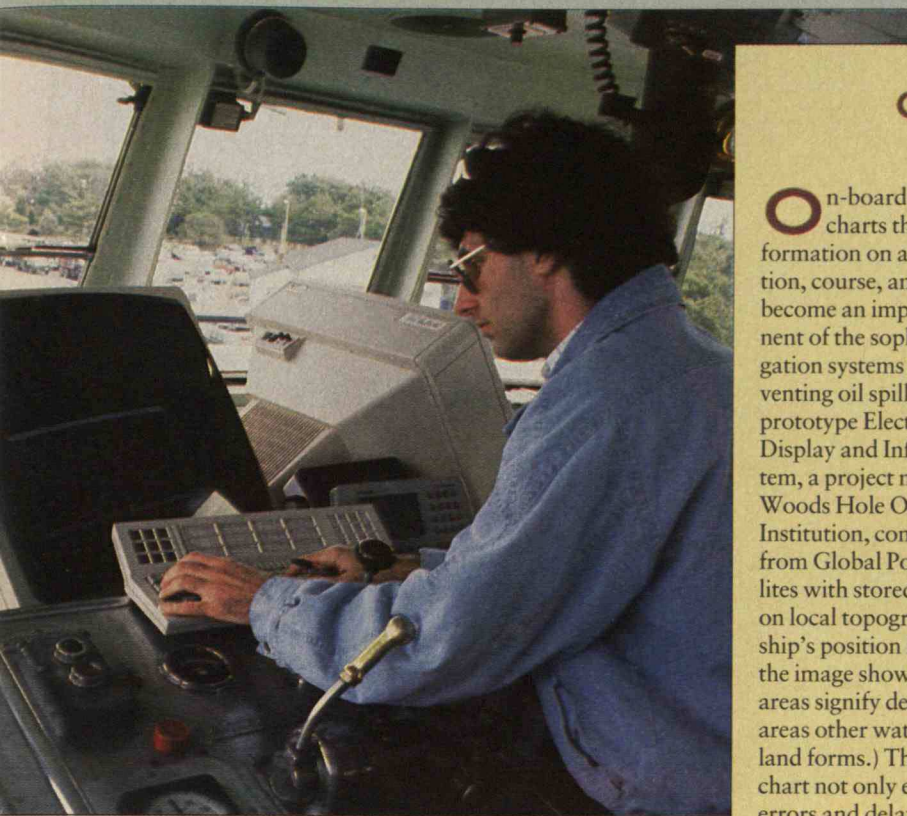
Meanwhile, the question is whether Congress will

amend OPA to allow designs other than double hulls, thereby encouraging new R&D. In one promising approach, crushable cellular hull materials such as composites, sandwiched between two steel sheets, would absorb substantial impact without bursting or puncturing, and perhaps not require extensive maintenance. As long as the law fixes on double hulls and lacks incentives, such innovations will languish on the drawing board.

Improving Prevention and Cleanup

OPA calls for new navigation systems to prevent ships from running aground or colliding. However, the act does not address a centuries-old navigation tradition that works against contemporary technology. In the aircraft industry, pilots must yield to the directions of air traffic controllers to avoid collisions and optimize use of airspace. But ship captains yield to no one, making their vessels vulnerable to circumstances outside their purview. Because “the port advises, the captain decides,” skipper and ship have had access to cutting-edge technology while radar and other port control systems, lacking a strong advocate, have lagged behind. The *Exxon Valdez* catastrophe could likely have been averted had guidance available to aviation been on line for ship transport, and had the skipper been required to obey port instructions.

Sophisticated tracking technologies such as the Elec-



COMPUTERIZING NAVIGATION

On-board electronic charts that provide information on a vessel's position, course, and speed could become an important component of the sophisticated navigation systems so vital to preventing oil spills. Here a prototype Electronic Chart Display and Information System, a project managed by the Woods Hole Oceanographic Institution, combines data from Global Positioning Satellites with stored information on local topography to track a ship's position in real time. (In the image shown far left, black areas signify deep waters, blue areas other waters, and brown, land forms.) The automated chart not only eliminates the errors and delays that occur when a ship operator plots information by hand, but it can also warn of impending groundings—especially important on the one-person bridges of modern commercial vessels. If the chart is linked with radar, the course and speed of nearby vessels can also be displayed.

Thousands of simpler electronic chart systems are already in use on recreational and fishing vessels. But because of legal and regulatory obstacles, it will likely be a decade before such systems are fully used on commercial vessels.

Under the international Safety of Life at Sea (SOLAS) Convention, most large commercial ships are required to carry paper charts, hand-drafted in government "hydrographic" offices whose mission is to map the sea floor and water depth. Many hydrographic offices are now digitizing their data files in an effort to automate the production of paper charts, thus making it easier to produce electronic charts as well, but the conversion process is time consuming

and a worldwide set of basic digital charts will not be available for several years.

Electronic displays may allow users to misinterpret data, making hydrographic offices reluctant to stand behind them. For example, a chart designed to be viewed on a scale of 1:20,000 may include a buoy near the end of a submerged reef. A user zooming in to a scale of 1:200 may erroneously think there is safe water between the buoy and the reef. To prevent such misinterpretations, the International Maritime Organization and the International Hydrographic Organization are developing display standards. Satellite data on a vessel's position could similarly lull navigators into a false sense of security: an operator might attempt to pass within 30 meters of a reef in a region that has been surveyed to an accuracy of only 100 meters. Many marine areas will have to be resurveyed to provide the needed detail.

Today paper charts are tediously updated by hand on each ship based on written notices from government agencies. Updating an electronic database would theoretically be easier, since corrections could be broadcast to ships in digital form and incorporated automatically. However, unresolved questions over which national and international agencies will be responsible for keeping digital maps current, and even which radio frequencies they will use to do so, promise to complicate the process. ♦

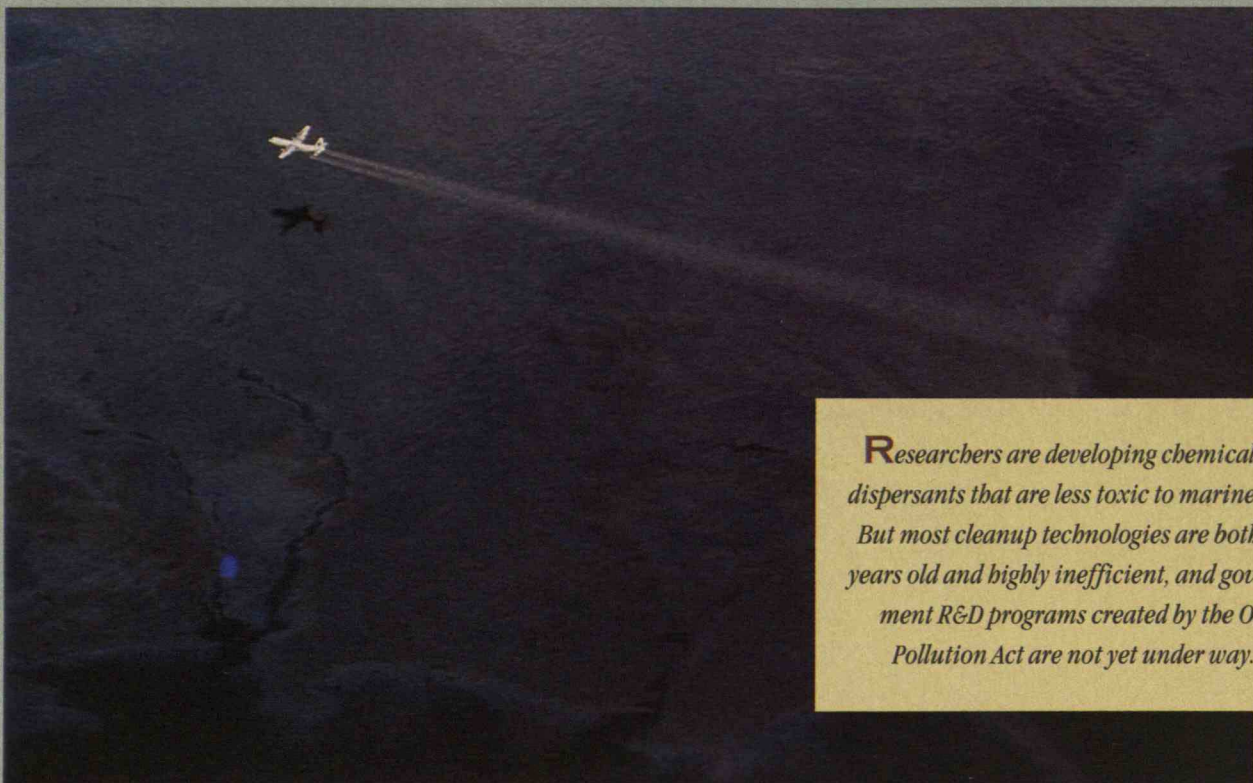
HAUKE KITE-POWELL

(The author is a research associate at the Marine Policy Center of the Woods Hole Oceanographic Institution, in Woods Hole, Massachusetts.)

tronic Chart Display and Information System, which provides all parties with comprehensive, real-time on-screen data, are becoming available. And an R&D effort has begun to determine which new port radar systems called for by OPA should be adopted. Use of these technologies would require a drastic change in the way ships and ports are run as well as intensive training for dealing with complex new information.

The Coast Guard is now evaluating price and performance tradeoffs of various navigation techniques and considering the recommendations of a recent report by the National Transportation Systems Center of Cambridge, Mass. Unfortunately, congressional politics are again muddying the water. Members of Congress are lobbying the Coast Guard to install port systems in their districts now, whether or not they are high-priority areas—and despite the fact that today's radar may soon need to be replaced with newer and more expensive microwave technologies used by the U.S. Navy.

In the eyes of many industry critics, the most important way to improve operations—and thereby prevent oil spills—is to raise liability limits on polluters. Before OPA, liability was governed by laws such as the Limitation of Liability Act of 1851, which imposed low ceilings that, a century and a half later, were clearly inappropriate. The new legislation boosts liability for spills dramatically, to as much as \$350 million for a single accident. OPA also removes all limits if polluters are



Researchers are developing chemical oil dispersants that are less toxic to marine life. But most cleanup technologies are both 20 years old and highly inefficient, and government R&D programs created by the Oil Pollution Act are not yet under way.

found guilty of gross negligence, willful misconduct, or other irresponsible behavior. The act further allows states to impose a separate system of liability on oil tankers in their waters.

Unfortunately, the latter two provisions may be counterproductive. Unlimited liability is rare in any industry. If an entity that can't afford to pay incurs huge damages, the public will end up footing the bill. OPA provides for a federal fund to pay cleanup costs in that situation, but such a fund will not encourage shippers to prevent spills. Large tanker operators have also threatened to abandon coastal navigation to fly-by-night operators if states set standards that shippers consider unreasonable. No major spill has yet occurred to test this threat, but Congress would do well to set liability limits that both encourage prevention and allow responsible operators to stay in business—while urging states to do the same.

If prevention does not work, the next defense is an efficient cleanup system that prevents spilled oil from harming natural resources. But at present both large and small spills are cleaned up the same way: with methods that are woefully out of date and abysmally inefficient. Emergency workers attempt to contain a spill with booms and then deploy skimmers and pumps to suck up floating oil, sometimes using chemicals to simply disperse the damage. Oil that reaches the beach, often many miles from the accident site, is scrubbed off with water or steam jets and sometimes even soaked up with straw or other absorbents, including paper towels.

When everything works in favor of cleanup—weather and currents are calm, equipment and trained workers are “at the ready”—10-20 percent of the spilled oil may be recovered. Some evaporates, but the rest sinks to the ocean bottom or washes ashore. And some cleanup techniques, particularly steam and chemicals, harm the environment out of all proportion to their benefit.

Two newer technologies may improve this record. Tiny, buoyant glass beads coated with a chemical catalyst that keep oil at the ocean surface and thus speed evaporation have reportedly been effective in small-scale experiments. Bioremediation—oil-eating microorganisms, some boosted with fertilizers—yielded mixed results when used on four beaches in Prince William Sound, with success depending on local conditions. Scientists are now attempting to improve and integrate cleanup technologies, developing booms with greater reach that are combined with hoses and barges to receive the spilled oil, and dispersants that are less toxic, for example. Engineers are also designing compact emergency equipment that tankers could carry on board.

But these technologies are receiving mostly private industry support because the OPA-mandated R&D programs have yet to be implemented. And cleanup technologies will probably never work on spills the size of the *Exxon Valdez* because of the sheer difficulty and magnitude of scaling up: the bigger the boom, the harder it is to transport and maneuver, for instance. The quantities of glass beads and fertilizer needed to handle

a large spill may also be prohibitive.

An industry organization, the Marine Spill Response Corp., is beginning to create contingency plans and establish regional sites with emergency equipment. But only the private sector has responded to OPA mandates, and this effort is just getting under way.

To make the oil-delivery system as effective as possible, we need a single agency empowered to oversee transport from well-head to distributor. Ideally, the director of that agency would have enough information to determine where accidents are most likely to occur and the authority and resources to take preventive action, such as awarding the best port technology to vulnerable high-traffic areas. The oil-transport chief would also direct government agencies in time of crisis, mobilizing emergency boats, booms, and people from both public and private sectors.

Yet central authority isn't what OPA provides. The intent is clearly to put the U.S. Coast Guard in charge of everything from cleanup to navigation, and the act does state that whatever cabinet-level official the Coast Guard answers to should be in charge of oil operations. But OPA ultimately disperses responsibility among many agencies, including the Environmental Protection Agency and the National Oceanic and Atmospheric Administration. The act also calls for a National Contingency Plan for "removal of oil and hazardous wastes" by "strike teams" ever at the ready. But national coordination must extend beyond this narrow concept of after-the-fact response.

To be truly effective, strategy must focus not just on responding to spills but also on preventing them. This means developing a national marine protection plan to harmonize the myriad managerial, scientific, and technical activities underpinning the oil transport industry. The oil chief would rely on this plan to enforce maintenance and operating standards for ships, ports, and waterways, retaining a high profile through an annual review similar to the Coast Guard's "state of the port," issued yearly to ensure military readiness.

An American Dilemma

Before the *Exxon Valdez* accident, the last close examination of oil transport problems occurred in the 1970s, sparked by controversy over the Alaska pipeline. The federal government and the state of Alaska gave Alyeska Pipeline Co., an industry consortium, complete responsibility for investing in spill-cleanup technology and preparing detailed emergency-response plans for the port of Valdez.

W E NEED
A NATIONAL MARINE
PROTECTION PLAN
TO MANAGE THE MYRIAD
ACTIVITIES UNDER-
PINNING THE OIL
TRANSPORT
INDUSTRY.

When no major spills occurred in that region during the following decade, everyone gradually stopped thinking about potential disasters. Alaskans, having no desire to kill their golden goose, learned to love big oil. Meanwhile safety was cut across the board, and the oil industry pursued efficiency by relying on bigger tankers and more sophisticated on-board navigation equipment while forcing smaller crews to work longer hours. Exxon reduced its spill-response operations, Alyeska cut personnel and stopped buying spill-fighting equip-

ment, the Coast Guard gutted its Vessel Traffic Service and crew-licensing programs, and Washington cut budgets. Federal and state authorities ceded watchdog authority to Alyeska, placing the fox in charge of the hen house. No single player could examine the tradeoffs being made to produce a more profitable system. Trusting in Alyeska, the public believed it was being protected.

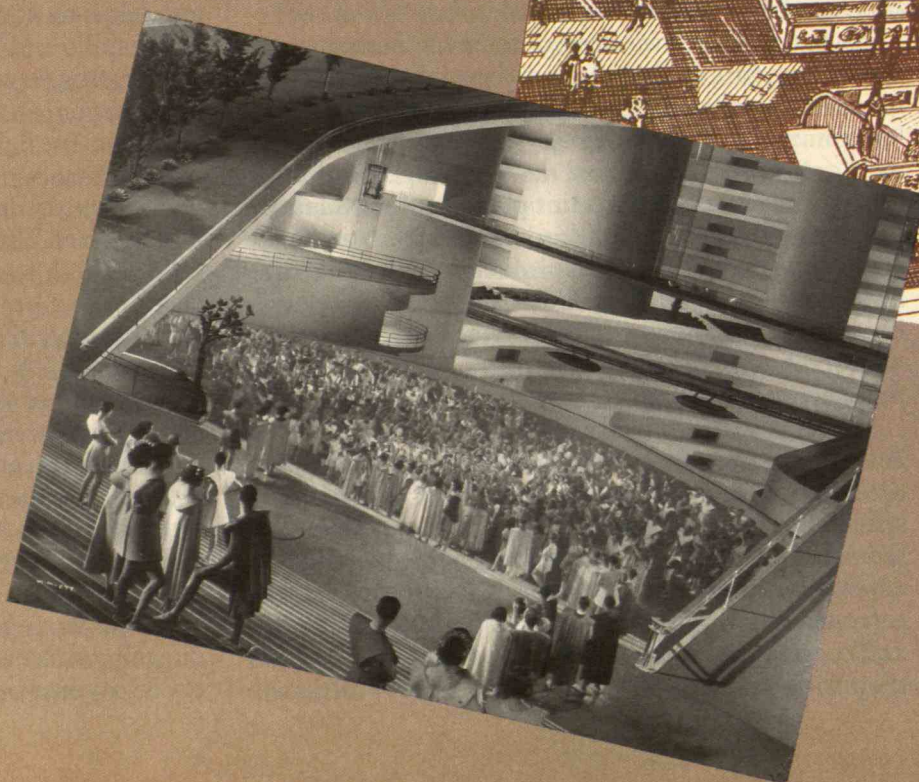
The *Exxon Valdez* spill, attracting more attention than the larger and more damaging *Torrey Canyon*, *Argo Merchant*, and *Amoco Cadiz* spills, therefore shocked the government into unprecedented attempts to understand what went wrong. Exxon, the captain, and the third mate at the helm initially received full blame, but investigations revealed human error and technological malfunctions throughout the system.

Establishing accountability by putting someone in charge of the entire system is thus a crucial step. But another is recognizing the strong link between the risk of oil spills and the demand for oil. Americans constantly struggle with the contradiction between an insatiable appetite for cheap oil and an intolerance for the environmental damage that results from delivering, refining, and using it. Even though energy use and pollution are inextricably linked, U.S. policy does not recognize that fact. This contradiction is plainly manifested in OPA, which focuses on better transportation and cleanup and perpetuates the myth that a mammoth response is all that's needed to handle a mammoth spill. Meanwhile, U.S. energy policies encourage use of fossil fuels, promote drilling in Alaska, and understate the need for conservation and alternative energy sources.

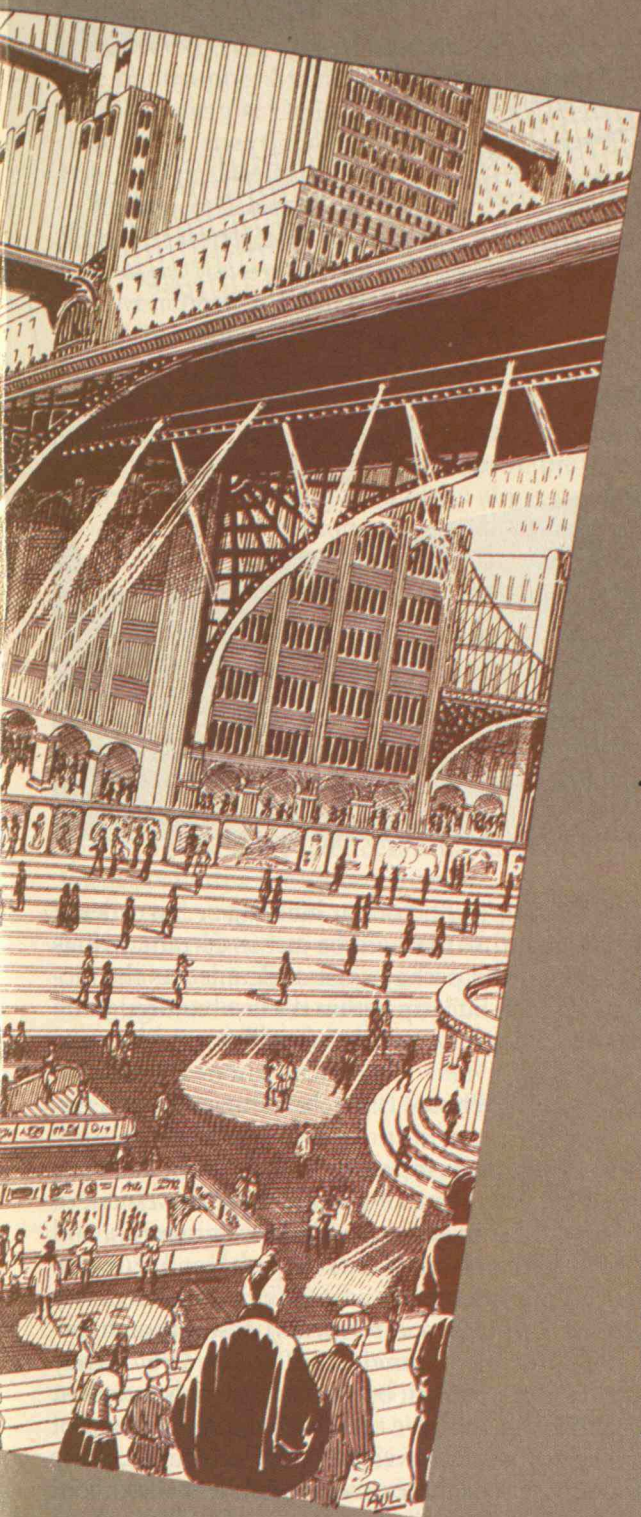
Old politics cannot be allowed to obstruct new strategies and technologies: OPA must be funded and strengthened lest it symbolically become the same deception for the American public as the Alyeska Pipeline Co., an empty solution to oil spills. But even OPA will never be a completely effective answer to the oil-spill problem. Ultimately, the best prevention strategy is to reduce oil use, thereby transporting less oil. ■



The prophecies of H.G. Wells, the father of futures studies, often came close to the mark. Although civilization in the year 2036, as envisioned in the 1936 film of his book *The Shape of Things to Come*, was just beginning to venture into space, the prediction of World War II was off by only a year (near right, top and bottom). A 1928 illustration for his "Story of the Days to Come," written three decades earlier, correctly anticipated animated billboards and Mobawks, even if mass-transit moving sidewalks have yet to catch on.



PHOTOS: BETTMANN ARCHIVE; DRAWINGS: *THE H.G. WELLS SCRAPBOOK*, EDITED BY PETER HAIN-
ING, CLARKSON N. POTTER, INC.



Tomorrow and Tomorrow and Tomorrow

By W. WARREN WAGAR

WHO, in 1902, foresaw the suburbanizing of North America, thanks to a vast proliferation of asphalt highways crowded with automobiles and trucks? Who anticipated modern total warfare fought with tanks (in 1903), fleets of bombers (in 1908), nuclear weapons (in 1914), and intercontinental ballistic missiles (in 1932)? Who in 1914 predicted the advent of atomic energy, and in 1920 the failure of the League of Nations? Who in 1933 imagined a second world war starting seven years from that time as a clash between Hitler's Germany and Poland? Who, in a lecture delivered in 1902, called for the creation of a new discipline, the scientific study of the human future?

The prophet in question was H.G. Wells. Novelist, biologist, journalist, historian, and futurist, Wells is best remembered today as the inventor of modern science

BY OFFERING

ALTERNATIVE VISIONS,

THE FIELD OF FUTURES

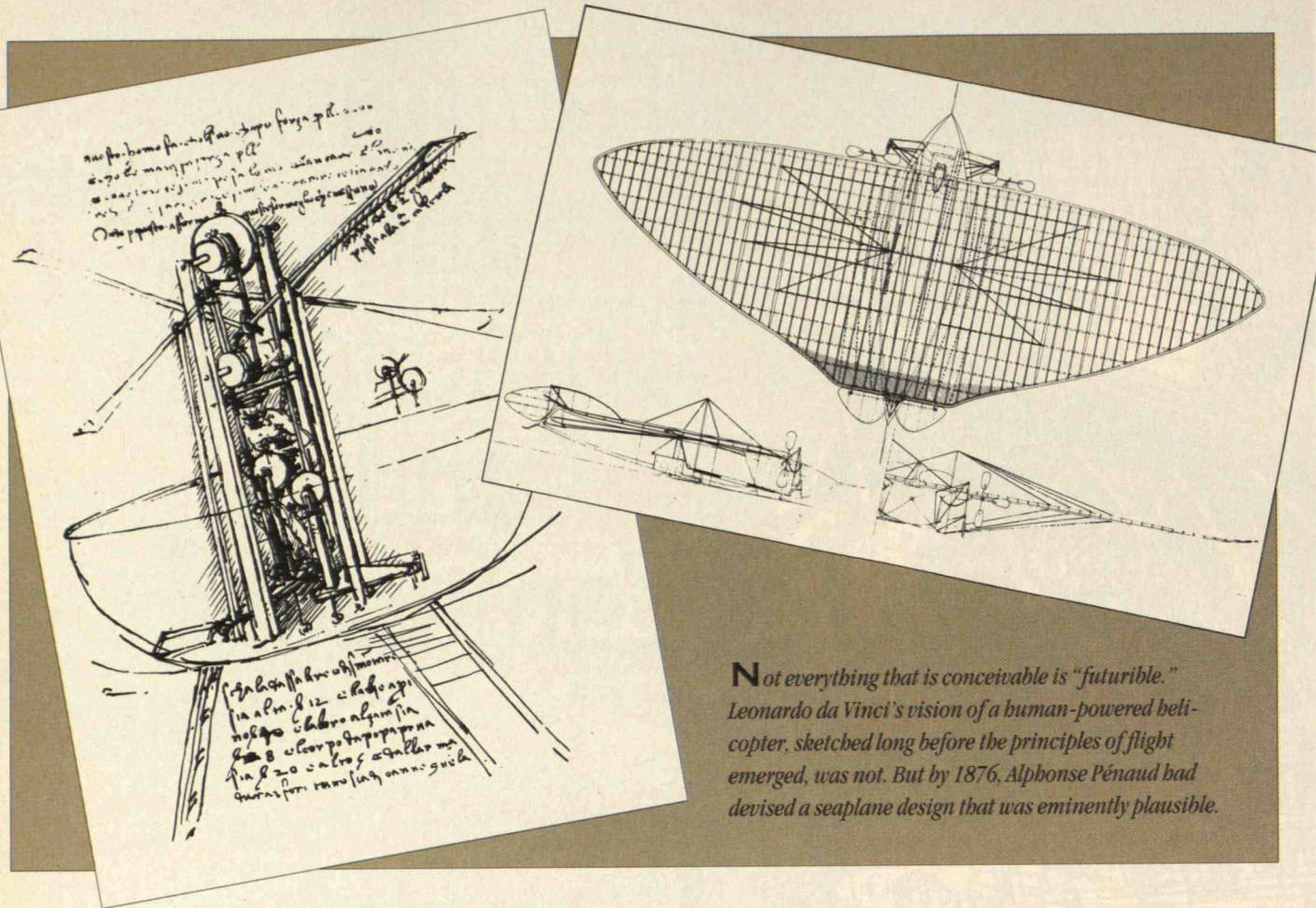
STUDIES CAN HELP US

FIGURE OUT WHERE WE'RE

HEADED AND WHERE

WE OUGHT TO BE

HEADED.



Not everything that is conceivable is "futurible." Leonardo da Vinci's vision of a human-powered helicopter, sketched long before the principles of flight emerged, was not. But by 1876, Alphonse Pénaud had devised a seaplane design that was eminently plausible.

fiction, in works such as *The Time Machine* and *The Invisible Man*. Late-night television watchers are often treated to screenings of his 1936 film *Things to Come*, with its vision of global war, salvation by technocracy, and astronauts fired into space.

But in his own time—he was born near London in 1866 and died there in 1946—Wells enjoyed a thriving reputation as a prophet, a twentieth-century Nostradamus who could be counted upon to get the future right. Though he did not always succeed, he was the public figure in the Western world most often sought out by publishers and editors for oracular pronouncements. Applying his skills in several different fields, Wells had a gift for seeing how all the activities of humankind—social, cultural, technological, economic, political—fit together to produce a single past, and by extension, a single future. If he had a keener sense of what was coming than his contemporaries, it was the holism of his vision that made the difference.

By precept and example, Wells worked tirelessly to convince his successors that the future of humankind—within the same limits that applied to prediction in the natural sciences—could be explored, measured, and known. Indeed, the natural sciences would play their part in the endeavor. "What is there to stand in the

way," he asked in 1902, "of our building . . . an ordered picture of the future that will be just as certain, just as strictly science, and perhaps just as detailed as the picture that has been built up within the last hundred years to make the geological past?"

Seeing the Future Whole

Since the 1960s, at least part of Wells's vision has been realized in the emergence of a loosely knit movement of natural and social scientists, engineers, humanists, and other professionals who call themselves futurists. Through organizations such as the World Future Society (founded in Washington in 1966) and Association Internationale Futuribles (founded in Paris in 1967), they hold conferences, publish books and journals, speak at public gatherings, and give one another a rough sense of common purpose. For every self-styled futurist, there are probably two or three other researchers who avoid the label but who do the same kinds of work and are well known in the futurist community.

The World Future Society's most recent directory of active researchers lists nearly 1,200 individuals from all over the world. Alvin Toffler (author of *Future Shock*, 1970) and John Naisbitt (author of *Megatrends*, 1982) are there. Lester R. Brown of the Worldwatch Institute is there. The Harvard sociologist Daniel Bell is there. So are the African economist Samir Amin, the Greek man-

W. WARREN WAGAR is distinguished teaching professor of history at the State University of New York at Binghamton. He has authored several books, including the recently revised *A Short History of the Future*.

agement expert Spyros Makridakis, the American New Age philosopher Marilyn Ferguson, and the German political scientist Ossip K. Flechtheim. Likewise, such deans of science fiction as Arthur C. Clarke, Frederik Pohl, and the late Isaac Asimov.

These people hail from widely different backgrounds. Some list impeccable academic credentials and some have none. Some work in universities, others in business or government, and still others are freelancers. They do not agree on political agendas or methods of research or visions of things to come. What binds them together, and may validate the enterprise of futures studies, is a Wellsian instinct for trying to see the future whole. At their best, such thinkers understand that the future will be created not by science and technology alone, or ideologies alone, or political institutions alone, or by any other single all-determining force. Just like the past, the future will be shaped by all the values, needs, and activities of our species. Working in concert or in conflict, these values, needs, and activities will produce each successive era in the files of future time. It follows that the futurist's special province is not so much leading-edge research as integration and synthesis of the work of others.

Not that most contemporary futurists have equaled the performance of H.G. Wells. His mix of abilities spanning the arts, sciences, and humanities is rare. Futurists with a grounding in environmental science are often politically naive. Futurists whose base of operations is political science routinely ignore or undervalue environmental issues. Those with special proficiency in mathematics or engineering frequently lack a feel for the human element, and humanistic futurists are weak in quantitative analysis and in technology assessment. Futurists trained in economics may overlook the power of cultural conditioning, and those with degrees in anthropology may overlook the capacity of economic systems to transform culture. So it goes.

Nevertheless, if futures studies have an excuse for being, it is their potential—still largely unrealized—to assemble the forecasting skills of a wide variety of disciplines and project plausible synergistic visions of whole futures: imaginatively conceived worlds in full swing with all their natural, social, and human complexity. As Wells wrote, futurists have the responsibility of “building an ordered picture of the future.”

But of course Wells betrayed his nineteenth-century positivist limitations when he used the word “picture” in the singular. If nearly all contemporary futurists agree on one thing, it is the virtual impossibility of knowing the real human future, the actual state of affairs in the world one century or one decade or even one year from now. Just as postmodern critics concur in finding no single correct way of reading a text, and postmodern historians smile at the notion of reconstructing the real and indisputable past, so futurists see their activity as the projection of *alternative* futures. Hence the phrase “futures studies,” with both words in the plural. We can extrapolate plausible futures. We cannot know which one will materialize.

The reason is obvious. As the mathematician John L. Casti writes in *Searching for Certainty: What Scientists Can Know about the Future* (1990), “It’s in those areas of the natural sciences least susceptible to human influence that we have the best ‘programs’ for prediction and explanation.” Foreseeing the future of systems in chemistry, physics, and astronomy is relatively easy. In the more complex realm of biology, which Casti calls “Jell-O-like,” prediction becomes correspondingly more difficult. “And by the time we reach the almost totally gaseous state of economics and the other social sciences,” he concludes, “there’s far more ‘social’ than ‘sci-

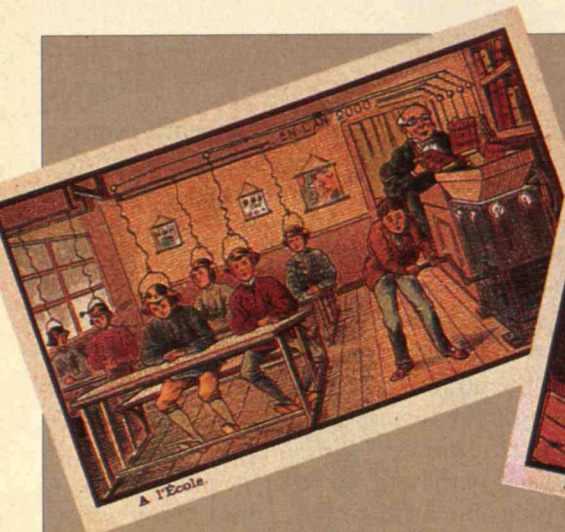
ANTICIPATING NUCLEAR WEAPONS

More than 30 years before the detonation of the first atomic bombs in New Mexico and Japan, remarkably similar bombs were exploding in a novel of world war by the founder of futures studies, H.G. Wells.

Certainly it seems now that nothing could have been more obvious to the people of the early twentieth century than the rapidity with which war was becoming impossible. And as certainly they did not see it. They did not see it until the atomic bombs burst in their fumbling hands. Yet the broad facts must have glared upon any intelligent mind. All through the nineteenth and twentieth centuries the amount of energy that men were able to command was continually increasing. Applied to warfare that meant that the power to inflict a blow, the power to destroy, was continually increasing. There was no increase whatever in the ability to escape. Every sort of passive defense, armor, fortifications, and so forth, was being outmastered by this tremendous increase on the destructive side. Destruction was becoming so facile that any little body of malcontents could use it; it was revolutionizing the problems of police and internal rule. Before the last war began it was a matter of common knowledge that a man could carry about in a handbag an amount of latent energy sufficient to wreck half a city. These facts were before the minds of everybody; the children in the streets knew them. And yet the world still, as the Americans used to phrase it, “fooled around” with the paraphernalia and pretensions of war.

—H.G. WELLS

The World Set Free: A Story of Mankind
(E.P. Dutton, 1914)



1



2



3

ence' in our capacity to say what's next and why." In short, the total human system that we call civilization enfolds too many variables, too many unknowns, too many unquantifiable values, too many ways of reading the texts that constitute our lives, to allow rectilinear prediction of the future. We must be satisfied with an

array of alternatives.

This is not to say that the alternatives appear in the minds of futurists out of nowhere. The great French futurist Bertrand de Jouvenel, in *The Art of Conjecture* (1964), drew the useful distinction between what is possible and what is "futurible." Almost anything is possible, he wrote, but "a future state of affairs enters into the class of 'futuribles' only if its mode of production from the present state of affairs is plausible and imaginable." In this sense, "a futurible is a descendant of the present, a descendant to which we attach a genealogy." Or, to use a different metaphor, jumping from point A (the present) to point F (the future) is always possible, but it becomes plausible only if we have enough knowledge to imagine the connecting points B, C, D, and E.

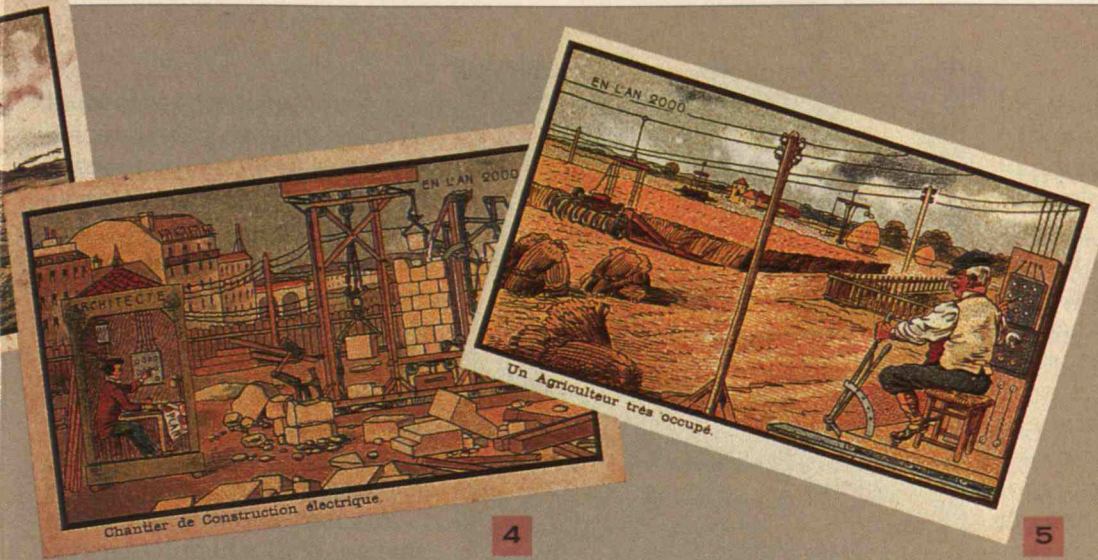
Jouvenel illustrated his distinction by contrasting prophecies of powered flight in antiquity with anticipations of the same thing in 1900. The ancients could imagine flying machines, but it was not until much later that a futurist (such as H.G. Wells writing at the turn of the century) could make the concept *futurible*. Only then did futurists wield enough specialized knowledge and valid theory to produce forecasts credible to the scientific and technical community. Moreover, when Wells and others did foresee powered flight, their knowledge of aerodynamics, metallurgy, mechanical engineering, and the rest enabled them to imagine several plausible

A WALL STREET PROPHECY

In a book published in 1982, three futurists predicted the New York Stock Exchange crash of October 1987—but not the recovery of the market that soon followed.

With the strain on the banking system from defaulting Third World loans, continued double-digit inflation, even higher deficit spending, and the realization that consumer demand was dead, certainly for the decade, perhaps forever, the stock market crumbled in 1987. Fortunes made in the early eighties, when the Dow Jones approached 2,000, disappeared overnight. Pension funds were the biggest losers of all. An increasing number of corporations suspended dividends. Savings institutions saw their deposits decrease, their loans default, and their portfolios shrink. Larger banks swallowed smaller banks and the liquidity of America and Americans came increasingly into question. Seeing that their unfunded pension liabilities had practically doubled overnight, corporations began laying off employees. Corporations that didn't or couldn't reduce staff found that these liabilities, in some cases, exceeded or equaled their net worth, in effect making them valueless. Municipalities and state governments had to reduce staff by hiring freezes and early retirement. Despite these cost-cutting moves, defaults on bond payments swelled until the bond market was in shambles. Hardest hit were the aging industrial centers from New England to Chicago. With high unemployment and negative economic growth, many municipalities went bankrupt. States like Ohio could not cope with their Clevelands, Akrons, and Toledos all becoming insolvent at once.

—PAUL HAWKEN, JAMES OGILVY, AND PETER SCHWARTZ
Seven Tomorrows: Toward a Voluntary History.
(Bantam Books, 1982)



In contrast to the sober predictions of H.G. Wells, turn-of-the-century French postcards whimsically imagined a machine-centered life in the year 2000: (1) programmed learning, (2) a letter transcriber, (3) a "hydroplane," (4) automated construction, and (5) automated farming.

alternatives, such as aircraft with fixed wings or with moving wings. In Jouvenel's words, "There was a plurality of futuribles and in general this is the case."

Some futurists, even very good ones, subscribe to the idea of alternative futures in one breath and then, in the next, trot out their favorite vision to impress on readers its near inevitability. But this is not to play the game by its rules. One way to avoid such a lapse from grace is to follow the example set by Paul Hawken, James Ogilvy, and Peter Schwartz in their remarkable book *Seven Tomorrows: Toward a Voluntary History* (1982), a set of fictional scenarios of a future America, each somewhat different from the other, depending on the variables tossed by the authors into their speculative hopper. The "tomorrows" range from an era of boundless growth and prosperity empowered by technology to an America that goes broke and loses faith in its destiny. Readers are invited to decide for themselves which America they find most credible, as well as which America they would prefer. Although the authors' own preferences never lurk far beneath the surface, they do give each scenario a fair run for its money.

But what are these divergent visions worth? Even assuming that the futurist

who produces them is an authentic polymath who tries his or her best to imagine only futurible worlds, what can the consumer of futurism hope to gain from access to such visions? If not accurate forecasts of what will really happen, then what instead?

At least three benefits spring to mind. First, and by far

AN AMPHIBIOUS FUTURE

*Can bioengineering produce new human species?
Meet the "merpeople" of the twenty-fifth century.*

During the second half of the twenty-fifth century, attitudes to genetic engineering changed markedly. As cosmetic engineering became commonplace, the public's view of human engineering inevitably relaxed. The more sweeping the tissue-transformations indulged in by adults, the easier became the argument in favor of ambitious modifications of human ova.

In spite of this relaxation of the taboo, the first significant attempt to create radically modified human beings was carried out in secret. The Australia-based Coral Sea Investments commissioned a team of human engineers . . . to adapt a group of six human embryos, three male and three female, for an amphibious existence. These adapted people were to have: gills as well as lungs; physiological protection against caisson sickness; skin designed to resist the corrosion of salt water; an extra layer of subcutaneous fat; webbed flipper-like feet; a lateral-line system of chemo-receptors to "smell" dissolved compounds in the water; and an echolocation system like that used by dolphins. The original ova and sperm used to fertilize them were donated by the senior members of the team of engineers. . . .

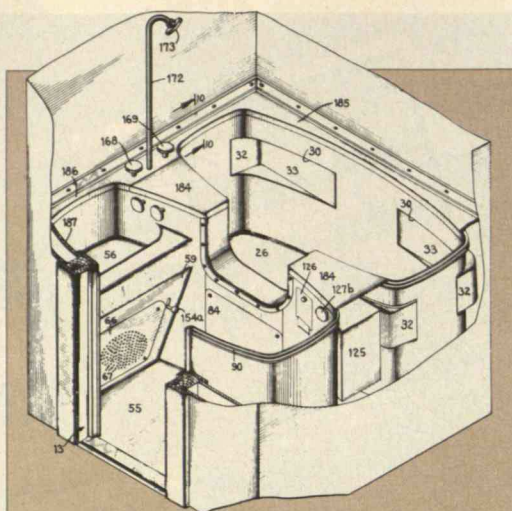
The six children were delivered from their artificial wombs between February and May 2485. It is known that one of the males died shortly afterward, but the records fail to indicate how many embryos were "spoiled" in the early stages of the experiment. This unusual lack of data illustrates the caution with which the project advanced. Secrecy was maintained for many years as the children grew up in artificial lagoons among the islands of the Great Barrier Reef. The first official announcement was delayed until January 2500, although some UN officials were already fully informed.

—BRIAN STABLEFORD AND DAVID LANGFORD

The Third Millennium: A History of the World: AD 2000–3000
(Alfred A. Knopf, 1985)

most important, well-argued visions of things to come can impart a sense of the *openness* of future history, the many plausible possibilities that lie before nations, institutions, and the whole human enterprise as we venture from the now into the next. Whether the futurist imagines near-future, medium-future, or far-future states of affairs, and whether he or she develops one scenario or a dozen, the cumulative effect of futures inquiry is to construct an inventory of human opportunities.

Such an inventory can offer invaluable help to planners in business and government, citizens in the voting booth, educators in the classroom, parents in the home, and anyone else who feels a sense of responsibility to later generations. It is not a substitute for planning. It cannot tell us what to do. But having the fullest possible knowledge of the viable options, and knowing how choices in one area of life are most likely to impinge on choices in other areas,



Futurist Buckminster Fuller (1895–1983) had great faith—too great, according to his critics—in technological solutions. The problem: the high cost of installing bathrooms. His solution: a lightweight prefab unit (1930).

are prerequisites to informed decision making. It has become common practice for government bodies and private corporations to hire or consult futurists to acquire the contexts they need to plan ahead intelligently. A good example is the Office of Technology Assessment, created by the U.S. Congress in 1972, which assists legislators in setting priorities for U.S. industrial and trade policy.

Another service of futurists is the sounding of alarms. Anyone seriously studying the future will see hazards as well as opportunities. If the study is projected far enough ahead, it is likely to catch glimpses of synergies that

could threaten the well-being and survival of nations, of races, of industrial civilization, or of the human species itself. Demographers, climatologists, weapons analysts, and many other specialists are the primary source of such information, but futurists with the right expertise can probe the interactions between threats arising from

different domains, imagine how they might feed on one another, plot the likeliest social impacts, and plead the case for prompt intervention to head off disaster before it occurs.

Consider, for example, the current worldwide anxiety about the health of the environment. The relative contributions of disciplinary specialists and of broad-gauged futurists to this anxiety are difficult to weigh, if only because many futurists are at the same time eminent specialists in this or that well-established discipline. But futurists have clearly had a hand in awakening public concern. The books and articles of Donella and Dennis Meadows, Richard A. Falk, Paul and Anne Ehrlich, Norman Myers, Mary E. Clark, and many others venture well beyond the fields in which each of these futurists was trained, and show a keen awareness of how the doings of nature and humankind intertwine. Voters and governments alike have responded to their appeals for action.

These responses may turn out to be too little and too late, but without the consciousness-raising efforts of futur-

SOUNDING AN ENVIRONMENTAL ALARM

Most in-depth futures research is done not by professional futurists but by social and natural scientists extrapolating from what they already know. The atmospheric scientist Stephen H. Schneider is one of today's foremost prophets of global warming.

The prospects for alleviating most foreseeable problems are good, but it isn't certain that anything much more than research funding will be instituted on a large enough scale before the atmosphere has itself performed its own experiments, now under way, with all of life on earth inside this unique laboratory—unless, of course, enough people demand otherwise.

"Are we entering the Greenhouse Century?" I asked in the subtitle of this book. . . . I believe we've been in it for a while already, but admit that it will take a decade or so more of record heat, forest fires, intense hurricanes, or droughts to convince the substantial number of skeptics that still abound. Unfortunately, while the antagonists debate, the greenhouse gases keep building up in the atmosphere. I wonder what we will say to our children when they eventually ask what we did—or didn't do—to create the Greenhouse Century they will inherit.

—STEPHEN H. SCHNEIDER

Global Warming: Are We Entering the Greenhouse Century?
(Sierra Club Books, 1989)

ists, it is safe to assume that much less would have been done, and will be done, to save the biosphere from the depredations of *Homo sapiens*. By the same token, many futurists and science-fiction writers graphically anticipated the horrors of nuclear war in the 1960s, '70s, and '80s. Their work may have helped slow the nuclear arms race and diminish East-West political tensions even before the collapse of the Soviet Union.

A Forward-Looking Curriculum

A third benefit of futures inquiry, which we have scarcely begun to reap, is its value to educational reformers. Throughout this century, educators have been searching for a principle around which to organize a coherent program of studies at every level of schooling. They have tried the so-called Great Books, geographical area studies, Marxism-Leninism (in the former Soviet bloc), multicultural studies, and various back-to-basics "core" curricula. Each approach has met with stout opposition for various good and bad reasons, and none has prevailed for long. American students in particular still tend to dine at pedagogical smorgasbords. They are generously fed, but not necessarily well nourished.

The obvious opportunity here is for futures studies to serve as the focus of educational programs. All human and natural systems have a future. No student will live anywhere else but in the future. Why not a curriculum in which the problems and opportunities of coming years play the lead role? History and the various arts and humanities can be taught as a process of cultural self-actualization moving relentlessly from past to future. The natural and social sciences can be taught as ways of understanding the world in order to shape its destiny. Students arrive at school yearning to know about their personal futures, and how their lives will connect to the larger life around them. Why not exploit this natural curiosity?

Here and there, in secondary-school honors programs and in inter-



Nuclear horror stories like Stanley Kubrick's 1963 film *Dr. Strangelove* attest to the power of futurist works to help avert the global catastrophes they sometimes envision.

disciplinary college offerings, futures inquiry has already penetrated the curriculum. Hundreds of educators have devised futures-oriented courses. My own classes at the State University of New York at Binghamton enroll more than 600 students a year. There is even a master's degree program in futures studies at the University of Houston at Clear Lake. But by and large the pickings are slim, and probably less abundant than in the 1970s and early 1980s, when studies of the future still had the cachet of novelty. Much remains to be done.

Not least among the tasks faced by futurists is the need to improve their product. The field has been around long enough to attract serious critics. Most of their criticisms are worth heeding. As Marshall W. Gregory pointed out several years ago in the educational journal *Change*, the various methods employed by futurists are "oddly, if not downright whimsically, dissonant." They range from hard-headed correlation

LOOKING FORWARD AND INWARD

Futurists deal with more than population trends, new technologies, and economic growth.

*Theodore Roszak saw in the religious revival of the 1960s and 1970s
a portent of spiritual revolution.*

The religious renewal we see happening about us—especially among disaffiliated young people, but by no means only among them—seems to me neither trivial nor irresponsible, neither uncivil nor indecent. On the contrary, I accept it as a profoundly serious sign of the times, a necessary phase of our cultural evolution, and—potentially—a life-enhancing influence of incalculable value. I believe it means we have arrived, after long journeying, at an historical vantage point from which we can at last see where the wasteland ends and where a culture of human wholeness and fulfillment begins. We can now recognize that the fate of the soul is the fate of the social order; that if the spirit within us withers, so too will all the world we build about us. Literally so. What, after all, is the ecological crisis that now captures so much belated attention but the inevitable extroversion of a blighted psyche? Like inside, like outside. In the eleventh hour, the very physical environment suddenly looms up before us as the outward mirror of our inner condition, for many the first discernible symptom of advanced disease within.

—THEODORE ROSZAK

Where the Wasteland Ends: Politics and Transcendence in Postindustrial Society
(Doubleday, 1973).

of statistical data, through such home-liner devices as trend extrapolation and historical analogies, to the imaginative binges of science fiction. Some futurists work with mathematical models of the world economy. Others search for evidence of a New Age in the rhapsodies of poets and mystics. How can there be a field of study with so many disparate methodologies?

One answer is that most fields of study today are riven by fundamental methodological schisms that go just as deep as those in futures studies. But these other fields usually have much longer histories and many more practitioners, who exhibit a keener awareness of the methodological issues that divide them. Because futurists work in so many disciplines and have so little regular contact with one another, they go their separate ways with only occasional flashes of anxiety about the heterogeneity of their methods.

The best way to remedy the situation is to found departments of futures studies with graduate programs—as Houston-Clear Lake has done—at various major universities. In sufficient numbers, such programs would quickly foster the kinds of collective introspection and sense of common cause that futures studies now lack. But given the state of most academic budgets in the mid-1990s, it will be a good many years before it is safe again to enter a university president's office with proposals to bankroll a new department. In the meantime, futurist educators need to coordinate their efforts and make more efficient use of the modest resources already at their disposal. The newly launched "Project Prep 21," sponsored by the World Future Society, is a fledgling effort in this direction.

The Taint of Ideology

A more serious criticism of futures studies is offered by Max Dublin in his recent book *Futurehype: The Tyranny of Prophecy* (1991). Dublin suggests that most futures inquiry serves vested interests. Futurists—Dublin likes to

VISIONS OF PLENTY

Few students of the future have had more faith in science and technology than the late Herman Kahn. Here, Kahn and his Hudson Institute colleagues anticipate abundance for centuries to come.

The position we argue is that, except for the occasional regional fluctuations caused by natural disaster, inappropriate policies, or the misapplication of resources, the long-term prospect is for adequate food supplies. By "adequate" we mean both an increasing amount of food per capita and an improving nutritional balance in the countries of the world currently deficient in either of these respects. Indeed, within 200 years we anticipate that—if desired—it will be possible to increase world food consumption to the level of the United States today (approximately 2,000 pounds per capita of grain equivalents annually). Our argument will be based upon what can be accomplished with conservative expectations for technological advance, coupled with reasonable management, but with no requirements for unusually good luck or especially fortunate technological breakthroughs, even though some such breakthroughs now seem inevitable. However, we will also assume sufficient economic development . . . so that either the poor can pay for the food they need or it can be financed.

—HERMAN KAHN, WILLIAM BROWN, AND
LEON MARTEL

*The Next 200 Years: A Scenario for
America and the World*
(William Morrow, 1976)

call them "trend-chasers"—urge us to climb on the bandwagon of established power, whether communist or capitalist, technocratic or bureaucratic, left-wing or right-wing. "Prophecy," he concludes, "is a basic tool of ideology. . . . In fact, attempts by one ideological camp to exert influence by 'outprophesying' the other have been prominent centerpieces in ideological propaganda wars throughout recorded history." By way of illustration, he cites the shrill claims of both Soviet and anticommunist Western futurists during the Cold War to have a corner on "scientific" thinking. Much the same point has been made, less astringently, in Barry B. Hughes's *World Futures* (1985) and my own *The Next Three Futures* (1991), which classify ideas of the future according to the ideological presuppositions of futurists. The "bases for the diversity" of such ideas, writes Hughes, are the "world views" or prescriptive "paradigms" that orient their thought.

Dublin goes awry in just one respect: he makes the untenable assumption that futurists serve only established power. His prime villains are people like James Burnham, Herman Kahn, Buckminster Fuller, Daniel Bell, Ervin Laszlo, John Naisbitt, and various Soviet futurists, whom he sees (not always correctly) as minions of the rich and powerful, urging us to bow to the inevitable conquering heroes of capitalism, communism, technological rationality, or whatever.

In reality, much contemporary futurism has strenuously opposed the status quo. What Hughes calls "neo-traditionalist" and I call "countercultural" futurism (one could also use such terms as "global-environmental" or "green" futurism) has emerged as perhaps the dominant strain in futures studies in the 1980s and 1990s. Prophets of "appropriate" technology and "anti-economics"—Theodore Roszak, Marilyn Ferguson, and others—use their skills to attack the conventional wisdom of both left and right, in defense of a quasi-mystical,

earth-loving, utopian vision of future life.

The problem here is the inevitable mingling of motives in futures inquiry. On the one hand, futurists want to discover what the future may actually hold in store. They hope that at least some of their alternative scenarios will come near the mark. On the other hand, they also work from a world view that powerfully influences what they are looking for and what they are most likely to find. In their pessimistic moments they see dire futures, and in their optimistic moments golden futures, but in either case they allow their vision of what is *desirable* to intrude on their vision of what, in Jouvenel's term, is *futurible*. Jouvenel himself anticipated this when he noted that "trying to bend the course of events in a way which will bring the probable closer to the desirable . . . is the real reason why we study the future."

I could not agree more. This is as it should be, since the future has not yet happened, and we owe posterity our best efforts to make it a good one. But the difficulty in "trying to bend the course of events" is that we may also try to bend the course of our futurizing, so that we make the best outcomes seem more plausible than in all good scholarly conscience they really are. The same thing happens in reverse when Cassandras like Paul R. Ehrlich habitually cry doom, making the worst outcomes seem more plausible than they really are, in order to jolt readers out of their complacency and spur them to remedial action.

The contamination of forecasting by ideology is not easily solved. It plagues virtually every field. But it can influence outcomes much more viscerally in futures studies. Prophets lose their credibility when they allow their wishes to befuddle their wits. Although they cannot help but make use of methods and

VISIONS OF COLLAPSE

One of the most important futures books ever written is The Limits to Growth. Its authors used computerized models of the world system to predict the inevitable collapse of modern civilization by the middle of the next century, unless . . .

Although we have many reservations about the approximations and simplifications in the present world model, it has led us to one conclusion that appears to be justified under all the assumptions we have tested so far. *The basic behavior mode of the world system is exponential growth of population and capital, followed by collapse.* As we have shown in the model runs presented here, this behavior mode occurs if we assume no change in the present system or if we assume any number of technological changes in the system.

The unspoken assumption behind all of the model runs we have presented . . . is that population and capital growth should be allowed to continue until they reach some "natural" limit. This assumption also appears to be a basic part of the human value system currently operational in the real world. Whenever we incorporate this value into the model, the result is that the growing system rises above its ultimate limit and then collapses. When we introduce technological developments that successfully lift some restraint on growth or avoid some collapse, the system simply grows to another limit, temporarily surpasses it, and falls back. Given the first assumption, that population and capital growth should not be deliberately limited but should be left to "seek their own levels," we have not been able to find a set of policies that avoids the collapse mode of behavior.

— DONELLA H. AND DENNIS L. MEADOWS,
Jorgen Randers, and William W. Behrens III
The Limits to Growth
(Universe Books, 1972)

theories grounded in value systems, they have the clear responsibility to monitor every forecast to ensure that it is not narrowly self-serving or contradicted by available data. The starting point for such monitoring must be an awareness on the part of every futurist, an awareness far from universal today, that ideology and forecasting are inescapably linked.

Of course, even stripped of bias, the futures business would still be hampered by the difficulty of knowing enough to speak with authority about the interactions of events in many quite different areas of human life. The kind of futurism I have been discussing is really most akin to the work done by historians such as Arnold J. Toynbee, Leften Stavrianos, or William H. McNeill, who "specialize" in the writing of world history. Experts in various subfields always manage to tear their books apart, showing the fallacies in every broad generalization. But scholars and the reading public alike keep turning to the Toynbees and the McNeills anyway. Now and then someone must assemble the imperfect fragments of our historical knowledge into a coherent whole, to give us a sense of where, as a species, we have been. H.G. Wells did just this in *The Outline of History* (1920), his best known work of nonfiction.

We also need a sense of where, as a species, we are headed. Right or wrong, bright or murky, visions of the future are visions we cannot live without. Although Wells's plea for an exact science of the future exaggerated what can reasonably be asked of mortal men and women, futures studies have a vital place in the sensorium of postmodern civilization. In the last third of a century, futurists have made a little progress. The well-being of our postmodern civilization may depend on their making a great deal more. ■

The Road from Rio



AN INTERVIEW WITH GRO HARLEM BRUNDTLAND

IT was the largest assembly of world leaders ever held. The U.N. Conference on Environment and Development last June in Rio de Janeiro—the Earth Summit—brought together leaders of some 173 nations to ponder the future of the planet and its people. Their goal was to reach agreement both on sweeping principles and policy measures to confront problems of climate change, biodiversity, deforestation, protection of the seas, and a variety of urgent social and economic issues. The meeting yielded a 600-page, nonbinding agreement called Agenda 21, which spells out how governments and businesses should behave to ensure that economic growth does not interfere with environmental quality.

Many of the ideas central to the Earth Summit were first defined for the global community in *Our Common Future*, a report issued in 1987 by the United Nations' World Commission on Environment and Development. This commission was chaired by Gro Harlem Brundtland, now prime minister of Norway. The Brundtland Report, as it is commonly known,

offered prescient analyses and recommendations on natural resources, population, food, energy, ecosystem protection, and economic development.

The report's key argument was that basic questions on the environment and economics can no longer be treated separately. Economic policies that have assumed an unlimited and self-restoring biosphere must now change to recognize severe ecological limits. The report recommended a strategy of "sustainable development" in which the material needs of all the world's people are met in ways that preserve the biosphere.

During the six years since it was published, *Our Common Future* has become an almost biblical text that people interpret as they please. Some see it as a manifesto calling for radical departure from

the standard economic practices of industrial society—urging transformation in humanity's relationship to production and consumption. Others interpret its message more modestly, finding the report a prescription for modified, environmentally prudent capitalism-as-usual.

*The prime minister
of Norway, who
launched the
"sustainable development"
movement, presents her
post-Earth Summit
agenda.*



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*"There is now
an awareness
among enterprises
that to retain their
competitive edge,
they have to strive
for environmental
excellence."*



Still a principal figure in these debates, Gro Harlem Brundtland brings a wealth of professional and political experience to her advocacy of what she calls "a global agenda for change." Affectionately called "Gro" (pronounced "Grew") by her fellow Norwegians, she is both an M.D. with long service in health-care organizations and a consummate politician, widely respected for her strong views and feisty manner.

Brundtland first came to prominence in the mid-1970s as an advocate for abortion rights and women's issues. She rose quickly in Norway's Labor Party, serving as minister of the environment from 1974-1979 and briefly as prime minister in 1981; only 41 years old at the time, she was the youngest person ever to hold the office. Brundtland served a second term as prime minister from 1986-89, and returned to the position in November 1990.

During the last two decades, she has been a leader in a successful movement to feminize her country's institutions, a process that has all but eliminated from Norway the "glass ceiling" that has prevented women from gaining the highest positions of leadership in most industrial countries. For her own political party, Brundtland introduced the principle that at least 40 percent of the candidates for election must be female and at least 40 percent be male. In her current government, women hold 8 of the 18 cabinet posts.

It is possible that an international movement for sustainable development could have arisen without a woman in the lead. But it is surely no coincidence that global economic policies based upon ideas of nurturing and sustaining have matured under the firm but caring guidance of Brundtland, who comes from a culture that has self-consciously defined a special relationship with nature. Norwegians are fervent lovers of the outdoors. From early childhood until old age they are found walking and skiing on their rugged country's abundant mountain slopes. Little wonder that Norway has served as the primary seedbed for "deep ecology," a philosophy that recognizes the integrity of nature as a supreme good.

Brundtland's views reflect the influence of Arne Naess, Erik Dammann, and other Norwegian thinkers who call for a fundamental transformation in humanity's relationship to the natural order, although she is not herself a proponent of deep ecology. In fact, staunch

environmentalists in Norway contend that her environmental-protection policies too strongly emphasize economic growth and reflect an excessive concern for business interests, a charge the prime minister vehemently denies.

The following interview with Brundtland was conducted by *Technology Review* columnist Langdon Winner, who recently spent a year as research fellow at the Center for Technology and Culture in Oslo.

TR: Was the Earth Summit the watershed event, the grand historic turning point, that many hoped it would be?

BRUNDTLAND: That will depend on how well we follow through on the commitments made at Rio. Observing the climate and biodiversity conventions, and responding to the whole of Agenda 21, would lead to an enormous level of activity for sustainable development. But many of us felt that the decisions made at Rio were far from adequate and in many fields actually represented setbacks from previous decisions by the international community. On population control, for example, it is deplorable to see that even stressing the need for universal access to family planning services was too rich a mixture for some countries. And most developed countries were reluctant to meet the legitimate requirements of developing countries for additional financial resources. We didn't even succeed in confirming the old U.N. target of having industrial nations transfer 0.7 percent of their gross domestic product to developing countries.

TR: In light of such disappointments, what of lasting value emerged from the Earth Summit?

BRUNDTLAND: I consider Rio to be the ultimate proof of the global recognition between environment and economy. For many years—well into the 1980s—most countries viewed these as separate matters. We now see a gradual process of learning around the world. There is, for example, a quite new awareness among enterprises that to retain their competitive edge, they have to strive for environmental excellence. New investments will most likely apply technology to minimize pollution and reckless consumption. Because of the Earth Summit's intensive publicity—CNN covered the meeting almost as closely as it followed the Gulf War—policies and investments that are unsustainable will be much harder to justify after Rio.

I see many encouraging signs. In rural dis-

tricts, sustainable management practices are on the move forward. And many Third World countries are becoming more democratic, allowing for greater public participation in development. All this is bound to have a positive effect on the prospects for sustainable development.

TR: Much of the hope for putting the principles of Rio into action rests on the new United Nations Commission on Sustainable Development. Realistically, what role can we expect the commission to play?

BRUNDTLAND: The new commission must become a political body—that means that the ministers of the world's governments must themselves take part in its deliberations and direct its work. Moreover, it must be assisted by a secretariat of the highest integrity that can act independently of the rest of the U.N. There is a clear need for reform and streamlining of how the U.N. deals with economic, environmental, and social issues. For example, look at the U.N.'s Economic and Social Council (ECOSOC). The ECOSOC ought to have strength and status comparable to the Security Council. In fact, however, ECOSOC has been dominated by middle-level officials for decades and governments have paid little attention to its deliberations.

TR: The commission will lack the power to enforce its recommendations. What will prevent it from becoming just another international agency producing studies and declarations that no one heeds?

BRUNDTLAND: That danger exists. But world leaders can take steps to make sure the commission is effective. Several years ago, Prime Ministers Michel Rocard of France, Ruud Lubbers of the Netherlands, and I launched an initiative leading to the Hague Declaration of March 1989, in which about 30 world leaders called for powers to enforce international regulations on atmospheric protection. The new commission should move forcefully in that same direction. It should, for example, set standards for permissible emissions of greenhouse gases—and establish an international authority with the power to verify actual emissions and to react with legal measures if there are violations of the rules.

TR: It seems unlikely that an international consensus will support such measures.

BRUNDTLAND: It's true that we have not been encouraged by the reluctance of many countries. But international cooperation cannot continue to require consensus on every issue. Consensus allows the slowest mover to determine the pace. I believe that the commission should make decisions by majority vote.

Pitting North Against South

TR: For many developing nations, environmental protection seem less urgent than hunger, disease, illiteracy, and foreign debt. Some observers criticized the Rio conference for not taking steps on those problems, debt relief in particular.

BRUNDTLAND: This complaint is justified to a considerable extent. Developing countries came to Rio with strong economic demands. In the South, many countries are suffering from decades of underdevelopment. Unless their economic predicament improves, they may turn away from a strong concern for sustainable development. This could take us into a vicious circle, because Northern countries will most likely only support financial transfers that are used for purposes that are sustainable.

TR: What kind of help for developing countries do you recommend?

BRUNDTLAND: The industrialized world not only needs to provide assistance in alleviating the tremendous debt burden that many countries are suffering, but should also help to introduce environmentally sound technologies. Also, many developing countries lack the institutional power to control the environmental impact of various patterns of production. The industrialized world ought to help establish and strengthen these institutions.

TR: How much will the transition to sustainable development cost?

BRUNDTLAND: The conference secretariat estimated that the cost of implementing Agenda 21 in developing countries would amount to \$600 billion a year from now until the year 2000. Four-fifths of that could be covered by the developing countries themselves, but industrial countries would have to contribute the remaining \$120 billion. This is about three times the amount of current development aid. It



“Alleviating poverty should be priority number one. Very little else will matter if more than 1 billion people live in absolute destitution.”



“One cost-effective way for an industrialized country to fulfill environmental goals is by investing in developing countries.”

also corresponds to the amount that would be available if all industrialized countries raised their development assistance per capita to the level of Norway.

TR: The commitments of financial support made at the Earth Summit fell far short of these targets.

BRUNDTLAND: Yes, and this is a crucial issue. As the leader of a country that has given more than 1 percent of its GDP to developing countries for more than 10 years, I find it deplorable that relatively rich countries fail to improve their performance. Few countries have made financial commitments to support implementation of Agenda 21 in developing countries. Some of the richest nations give the smallest amount of aid as a percentage of GDP, primarily because taxation for aid purposes does not command political support.

While keeping the pressure on those countries who could do more, we should also explore the opportunity for nations to implement their obligations jointly. A country might find that one cost-effective way to fulfill its national environmental goals is by investing in activities in developing countries. Greenhouse gases, in particular, have an equal effect on the global climate regardless of their place of emission. So if you were seeking to invest \$1 million to reduce your emissions, it just might be that the effect of that investment would be greater if it were made in another country—say, in Eastern Europe or in Southern countries. Norway is working with the World Bank to study how this can be done.

TR: But don't people in your country want Norway to spend its environmental money in Norway?

BRUNDTLAND: Yes, and sometimes they're right. If, for example, the sole purpose of a given investment is to lower sulfur emissions, then local spending makes sense. But since 90 percent of all acid rain falling on Norway comes with winds from foreign countries, we would also do well to invest in clean coal technology abroad.

TR: The Agenda 21 document produced at the Earth Summit rivals *War and Peace* in length and number of subplots. Which proposals

need the most urgent attention?

BRUNDTLAND: Alleviating poverty should be priority number one. Very little else will matter if more than 1 billion people continue to live in absolute destitution. Only by educating people and giving them a fair chance to break out of poverty can we hope to find a sustainable relationship between population and resources. Otherwise, we will be forced, by default, to continue overusing natural resources. This is what Indira Gandhi meant when she said that “poverty is the greatest polluter.”

A New Kind of Growth

TR: The world's economic system—its patterns of property, production, commerce, and national interest—arose during an era in which rapid exploitation of natural resources seemed reasonable. Can sustainable development be achieved by merely modifying this system, or are fundamental changes in the economic structure required?

BRUNDTLAND: No, modifications will not be enough. We in the North and the rich in the South will have to change our patterns of consumption and production. Studies undertaken for the World Commission on Environment and Development showed how we can maintain the same standard of living with far less use of finite resources—for example, by improving the energy efficiency of our buildings and vehicles and by using manufacturing methods that are less material-intensive. We have some evidence that this works: the countries with the most stringent environmental measures at present also happen to be the largest exporters and the ones with the most flourishing economies.

Such changes will require political direction and strong support of a democratic populace. Global change depends on our ability to adapt market mechanisms to promote sustainable development. In Norway, for example, we have studied how we might influence human behavior toward more sustainable patterns by using targeted duties and levies without raising the overall level of taxation.

TR: Despite the affirmations at Rio, most politicians and economists continue to tout sheer economic growth as the cure for all social ills. Don't we need new ways of thinking about these matters?

BRUNDTLAND: We still need growth—but it will have to be a new kind of growth, where we extract less of the world's limited resources and where we satisfy our needs using production processes that require fewer raw materials. We need to pursue a "cradle-to-grave" approach, where companies take responsibility for their waste and use of resources throughout the production cycle—from extraction to manufacturing to recycling to ultimate disposal. Many politicians are moving away from the unqualified concept of growth without environmental concerns. They realize that economic growth is a concept that does not say much about the quality of life or about the prospects of future generations to enjoy the same or wider opportunities.

TR: How do you balance your long-term concerns for the global environment with the immediate demands for economic prosperity in Norway?

BRUNDTLAND: Norway is party to more global environmental agreements than other countries. We have imposed on ourselves some of the most stringent environmental measures in the world. We have done so to an extent that has cost us perhaps too much, but steps of this kind require international coordination in many fields. There are limits as to how far you can go in imposing environmental taxes, for example, unless other countries do the same.

TR: The world's transnational corporations will play a large role in determining the success or failure of the policies you endorse. But aren't these companies less concerned with sustainable development than in sustainable profits?

BRUNDTLAND: Already, several international non-governmental organizations have pressured these companies to use more self-restraint than existing laws and regulations require. And many transnational corporations have restricted themselves voluntarily, such as by pledging not to apply technology abroad that would be unlawful if applied in the headquarters state.

TR: How can the world spur the scientific and technological advances that might help sustainable development succeed?

BRUNDTLAND: Environmental taxes and

duties often force companies to accelerate their research and innovation for reducing pollution. Many studies have confirmed that revenue-neutral shifts in taxation patterns can be developed to pursue sustainable development. Norway has established a Green Tax Commission that studies this issue. Other organizations, such as the World Resources Institute [Washington, D.C.], have presented a good case for changes in taxation in the United States. Such funds should be applied to developing technologies for energy conservation, clean fuels, waste reduction, and cradle-to-grave production schemes. Governments and the private sector should cooperate to achieve these goals.

TR: Nearly six years have passed since the urgent warnings of the Brundtland Report. Are you now more hopeful about the human prospect, or less?

BRUNDTLAND: As I said in Rio, we have seen progress in many fields, little progress in some fields, and no progress at all in others. We have concluded several international agreements. True, they are not perfect. The Climate Convention, for example, fails to set targets and timetables for reduction of greenhouse gases. The negotiations will continue, however. And I believe the dynamic new administration in the United States offers high hope for progress.

According to the U.N. Development Program, life expectancy is increasing, infant mortality is falling, and access to education is improving. If the shift from military spending toward health, education, and environmental protection continues, we may see important improvements in living conditions all over the world. We might have even higher hopes if countries finally agree to address the population problem in a responsible manner.

I am convinced that we will succeed in standing up to the dangers facing us because there are simply no alternatives. We must manage the most important global transition since the agricultural and industrial revolutions. My faith rests in the youth of the world—custodians of the present and trustees of the future. Someday, when people look back on the present generation, we want them to be able to say: faced with the challenge, they managed to upgrade human civilization. ■



*"My faith rests
in the youth of
the world—
custodians
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trustees of the
future."*

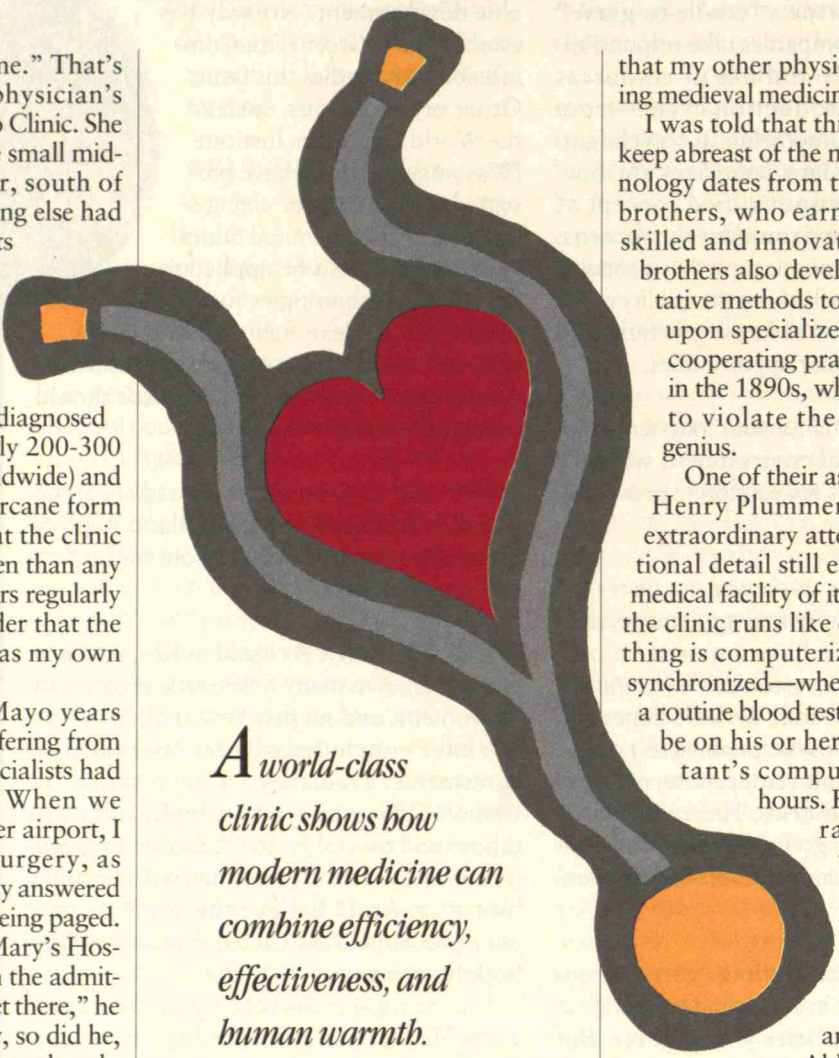
Medicine with a Heart

It's the BMW of medicine." That's how a good friend, a physician's wife, described the Mayo Clinic. She had taken the trek to the small midwestern town of Rochester, south of Minneapolis, when everything else had failed. None of the specialists in the nation's capital could find the source of the chronic digestive failure that was causing her to lose a pound a week.

Clinic physicians quickly diagnosed a rare stomach disorder (only 200-300 cases reported each year worldwide) and successfully performed an arcane form of surgery. It turned out that the clinic treats this problem more often than any other facility—a tale one hears regularly at the Mayo. It's little wonder that the clinic gets the tough cases, as my own experience suggests.

I first encountered the Mayo years ago when my father was suffering from a brain tumor that other specialists had pronounced inoperable. When we arrived at the small Rochester airport, I called the chief of neurosurgery, as instructed. The doctor cheerily answered my call a minute or so after being paged. "Take your dad over to St. Mary's Hospital and I'll be in touch with the admitting people by the time you get there," he advised. I did and, startlingly, so did he, dropping by to see my father shortly thereafter. Jolted out of my learned cynicism about the medical profession, I nevertheless told myself that the doctor was probably an old-fashioned midwestern guy, an exception that proves the rule.

But our ensuing experience with physicians, staff, and administrators was equally pleasant, and my father's "inoperable" tumor was successfully removed. Many other acquaintances report similar experiences that attest to an institutional pattern rather than an occasional exception. Human, efficient, competent, personable—the Mayo Clinic is everything one hopes modern medicine can be. And this from one of the world's leading medical centers, where Ronald Reagan and King Hussein of Jordan have recently been patients.



A world-class clinic shows how modern medicine can combine efficiency, effectiveness, and human warmth.

When I took my father for brain surgery, the clinic had recently devised new optical instrumentation that permitted far greater sensitivity and accuracy in microsurgery. During a recent visit of my own, a specialist was almost dumbfounded when I said that two physicians in Washington, D.C., had recommended surgery. "In the first place, surgery is not indicated in your case," he said. "In the second place, we hardly ever do surgery in situations even remotely similar to yours—and haven't for years. When we do have to intervene we use laser or microwave techniques." He conveyed the distinct impression, shaking his head and saying something about "antiquated" and "obsolete,"

that my other physicians were practicing medieval medicine.

I was told that this determination to keep abreast of the most advanced technology dates from the founding Mayo brothers, who earned reputations as skilled and innovative surgeons. The brothers also developed group consultative methods to a fine art, drawing upon specialized knowledge from cooperating practitioners at a time, in the 1890s, when the idea seemed to violate the ideal of the lone genius.

One of their associates, physician Henry Plummer, contributed the extraordinary attention to organizational detail still evident. The largest medical facility of its kind in the world, the clinic runs like clockwork. Everything is computerized and seemingly synchronized—when a specialist orders a routine blood test, the results seem to be on his or her desk (or an assistant's computer) within a few hours. Hundreds of subterranean pneumatic tubes quickly carry bulky records from the main building to other facilities and medical centers around town.

Although thousands of tests and records are processed each day, patients experience little of the waiting typical of medical visits. They usually fill out the basic informational forms before coming to Rochester. In my own case, I had been told to prepare for at least three days in Rochester. When I had been examined by my specialist, the chief of his division, he said: "Let's see if we can get you out of here and home today." And he did: after our initial consultation at 8:30 a.m. I marched through a battery of tests, and when I met with him at 4:30 p.m. he had assembled and digested the results of my workup. This careful scheduling also produces, I am sure, efficient use of expensive x-ray, MRI, and other equipment.

Although the clinic conducts a great

deal of research, R&D and teaching do not dominate as at university medical centers. The central mission is treatment of patients, and this priority is evident even in architectural details. For example, a patient appearing for an x-ray enters a small dressing room from a main corridor. He or she is able to lock the door from the inside and can therefore safely leave valuables—there is no need for the usual sign disclaiming responsibility for lost or stolen items, and none is evident. Another door leads directly to the x-ray room but has no handle: it can be opened from the other side only when the technician has completed work with the preceding patient. This design insures security, privacy, and an effective patient flow.

The result is that while the clinic is not a profit-making institution, it seems to be more efficient than any profit-making medical establishment I know. And the Mayo does not appear especially expensive. The waiting rooms are filled with ordinary midwestern folks sitting next to matrons in Dior suits.

I'm sure a good deal of what works at the Mayo Clinic can be traced to team spirit: its employees clearly know they are practicing or supporting world-class medicine, and no one would tolerate doing less than the best. "The people who scrub the floors at night have as much pride in their work as the surgeons," a physician who studied at the clinic recently told me, "and they are as important as any other factor." Of course, the staff is concentrated in one small, isolated Minnesota town where the clinic is the central focus. Still, there is clearly something special going on at the Mayo—something of importance far beyond the world of medicine.

A central question of our time is how to integrate advanced technology with large numbers of people in a caring and personal way. The Mayo Clinic clearly has a great deal to teach. ■

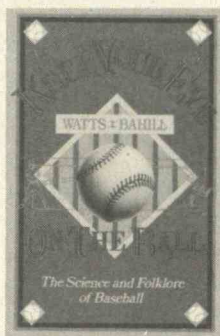
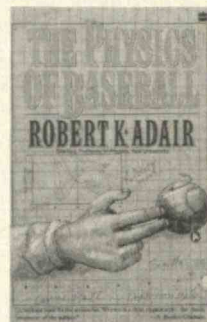
GAR ALPEROVITZ, a historian and political economist, is president of the National Center for Economic Alternatives in Washington, D.C. He is coauthor of Rebuilding America (Pantheon, 1985).

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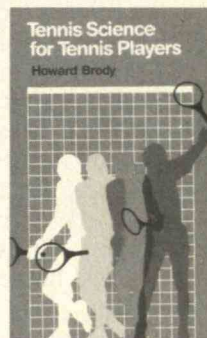
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Peace in Progress

ONE of the pleasures of being an engineer lies in the hope that technology, in the long run, enhances prospects for world peace. Wouldn't material abundance for all eliminate the main motivation for neighbor to war upon neighbor? If so, the search for cheap energy, plentiful food, and affordable consumer goods becomes in effect the quest for the Holy Grail.

The events in Bosnia these past months make such a notion seem foolishly naive. In that mountainous realm, until recently a part of Yugoslavia, the carnage and suffering have been horrifying beyond belief. In the heart of Europe—"civilized" Europe—ancient enemies, ethnic and religious, are playing out a primal tragedy that seems destined to go on forever.

If communal hatred inevitably leads to war, and if such hatred is rooted in history and human nature, then it is illusory to think that technology can help. Well-equipped police forces can impose order, but that sort of solution gives little reassurance for the future of humanity. Small wonder that the latest Balkan conflict, added to long-standing strife in Africa, Northern Ireland, the Middle East, and elsewhere, gives rise to deep-seated pessimism. Engineering progress seems powerless in the face of age-old tribal hostilities.

Yet, perhaps we are drawing unwarranted conclusions about cause and effect. One can think of many places in the world where ancient animosities burn fiercely yet war is unthinkable. Take Belgium, for example. A few years ago I visited with some people there and was astonished to find how bitter are the feelings between the country's Flemish-speaking and French-speaking peoples. This acrimony has on occasion boiled over into demonstration, and even riot, but solutions are inevitably found in political compromise.

The same can be said of Canada. I have spent time with engineers in Montreal and Toronto and could scarcely believe the hostility that exists between people—even coprofessionals—because

of language and cultural differences. Yet it would be absurd to suggest that civil war is likely to break out in Belgium or Canada.

What is there about those two countries that makes them different from Bosnia? Many things, to be sure, and I don't want to be simplistic; but the contrast that looms largest is their levels of prosperity. Bosnia is relatively poor; Belgium and Canada are relatively rich. Where people are well-fed, comfortable, and secure, and where citizens feel that they have an investment in the community that provides for them and their families, civil war is unlikely to erupt. Belgians and Canadians can hate as fiercely as Bosnians: one need not argue that prosperity brings virtue, merely that it inclines people toward keeping the peace.

There is another reason why Bosnia is a quintessential candidate for civil strife.



It is a mountainous region, long isolated from the outside world and topographically suited to tribal conflict. Slobodan Selevic, a prominent Serbian writer who opposes the aggressive policies of Serbian President Slobodan Milosevic, has pointed out that Serbs who live in the flatlands tend not to be belligerent. Mountain Serbs, on the other hand, lived for centuries as *hajduks*, or outlaws, resisting the rule of far-away central governments. This group represents "a different culture."

How does one alleviate the isolation, and possibly lessen the suspicious pugnacity, of mountain people? By building bridges, of course. Ivo Andric, a Serb

and a Bosnian who was awarded the Nobel Prize for Literature in 1961, reflects on this theme in *The Bridge on the Drina*, a historical novel set in the village of Visegrad near Sarajevo. According to an ancient myth, recounted by Andric, when the earth was created its surface was totally smooth. But the devil, envious of God's gift to humankind, scratched the earth with his nails. Thus "deep rivers and ravines were formed which divided one district from another and kept men apart, preventing them from traveling on that earth that God had given them as a garden for their food and support." To ease the torment that ensued, the story goes, God sent down a band of angels, who spread their wings across the ravines, enabling people to communicate with one another and to reach their places of work. "So," concludes Andric, "men learned from the angels of

God how to build bridges, and therefore, after fountains, the greatest blessing is to build a bridge and the greatest sin to interfere with it."

Prosperity and communication between peoples: two worthy objectives that might do much to improve things in Bosnia and elsewhere. In the midst of disheartening conflict, there are reasons to hold fast to the vision of a peaceful world, and the engineer's role in making it a reality. ■

SAMUEL C. FLORMAN, a civil engineer, is the author of *Engineering and the Liberal Arts*, *The Existential Pleasures of Engineering*, *Blaming Technology*, and *The Civilized Engineer*.

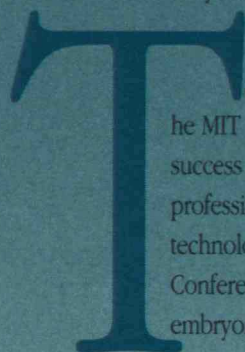


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Making Inroads on Infrastructure

As Bill Clinton begins his presidency, he faces controversy on almost every economic issue. But on one question there is a fair degree of consensus: the desirability of redeveloping the nation's transportation and communications infrastructure.

Infrastructure activities—rehabilitating harbors, patching up roads, building high-speed trains, and creating fiber-optic telecommunications highways—have several benefits. They create jobs, mainly among private-sector contractors, and according to most economists, they make all other businesses more productive and profitable by enhancing access to information, by reducing congestion, and by cutting down on travel time. Because infrastructure projects have in government a guaranteed customer and financier, public managers can afford to use the programs to encourage experimentation with new building materials and environmental technologies. Government can also use infrastructure spending set-asides to promote minority-owned businesses.

But in moving ahead on this desirable front, the administration has to resolve several basic questions. The first is how much to spend. Clinton has talked about a minimum of \$20 billion a year for at least the first two years of the new administration. Given the country's present economic predicament, this may be too timid. Factories are operating far below their full potential capacity, and the unemployment rate hovers well above 7 percent. A recovery is underway, but by historical standards, it is anemic. Some analysts argue that an economy with this much "slack" can absorb a much larger injection of new federal spending without igniting inflation and the corrosively high interest rates that would follow as investors demand a "premium" for financing the deficit. At last December's teach-in in Little Rock, for example, Yale Nobel laureate James Tobin argued eloquently for spending an additional \$60 billion a year.

Question two is where to get the money. To create the most jobs, Clinton

could finance the programs entirely out of short-run deficit spending—that is, by borrowing the money from the private sector and from foreign investors. Some Clinton advisers think this course would be politically impractical, however; strong opposition would come from Wall Street, which is skeptical about Tobin's projections and which fears an inflationary spiral that would erode investors' assets. The administration may therefore settle for the milder stimulus of a "revenue-neutral" approach, paying for infrastructure with additional taxes or spending cuts in other programs.

Other options are worth examining. Since the mid-1970s, Wall Street investment banker and sometime Clinton adviser Felix Rohatyn has urged the United States to establish a "national development bank." This quasi-public institution would be devoted explicitly

large share of domestically produced materials and equipment but without trying to mandate "buy America" policies that might undermine international goodwill and that would be difficult to enforce. In the long run, this objective can be achieved only by rebuilding the competitive advantages of companies producing within our borders—just the sort of challenge that Laura Tyson, chair of Clinton's Council of Economic Advisers, has been urging for years.

In the short run, the government might set as a goal that some share of any foreign country's sales to infrastructure contractors originate in facilities located inside the United States: more U.S. jobs are created when Mitsubishi Heavy Industries builds road-building equipment here, say, than when a U.S.-based infrastructure contractor imports Mitsubishi equipment from Japan. President Reagan successfully used such



to infrastructure, floating bonds to pay for such long-lived assets as "smart" highways, digital communications networks, and the cleanup of toxic waste dumps. Alternatively, a congressionally mandated Infrastructure Investment Commission recently suggested tapping into pension funds to find the "patient" capital needed.

The administration must also grapple with the problem of making sure that the jobs created by infrastructure spending will be located mainly in this country. U.S. companies presently buy about half of their non-transportation capital goods from abroad. Clinton will want to ensure that infrastructure projects use a

"local content" regulations to encourage Japanese automakers to build plants in this country. If it was good enough for Reagan, why not for Clinton?

The call for new infrastructure spending, which sounded so straightforward during the election campaign, is turning out to be more complicated than it once appeared. But did anyone really imagine that "growing the economy" was going to be a rose garden? ■

BENNETT HARRISON is professor of political economy in the H. John Heinz III School of Public Policy and Management at Carnegie Mellon University, where he specializes in economic development and industrial policy.

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Reviews

TELEVISION

PHYSICIAN, HEAL THYSELF

Medicine at the Crossroads
Produced by Thirteen/WNET and BBC-TV
Eight-part series airing
on four consecutive Mondays
April 5 to 26, 9–11 p.m. (ET), PBS

BY EVELYNN M. HAMMONDS

WITH U.S. medical costs estimated to reach \$1 trillion in the next decade and the debate over health care reform commanding daily attention, medicine indeed sits at a crossroads. Few people are satisfied with the increasingly high-tech health care practiced in this country or elsewhere. In *Medicine at the Crossroads*, public television explores the failures of modern medicine from the perspective of doctors, nurses, and other care providers, as well as patients.

Although these groups do not agree on what constitutes high-tech medicine, what its problems are, or how to fix them, the worst defect of today's medicine, as depicted in this series, is its overreliance on science and technology at the expense of the patient. Each program presents a case study addressing a particular aspect of this problem.

No Time for Patients

The opening program, "Temple of Science," provides the most comprehensive illustration of the theme. The temple in question is the modern teaching hospital, shown to embody all that is wrong with modern medicine.

We meet the class of first-year residents at Johns Hopkins University Hospital, one of the country's premier teaching hospitals. As they work grueling 36-hour shifts treating the very sick, poor, and largely black patients who come to the emergency room, the strain on the residents is palpable. They strug-



gle to maintain their distance from these patients, showing little real empathy for the conditions they face. While the residents argue that excessive demands force them to limit the time they spend with patients, their instructors see a different problem: it's not that the training is too physically demanding but that it is too focused on acute care rather than on the kinds of cases physicians are most likely to encounter once they begin to practice.

Patients, meanwhile, complain that the residents are obsessed with technology to the detriment of care. When tests fail to reveal the cause of a woman's serious illness, the residents propose still more tests—even though they doubt the results will be any more illuminating. The new tests do not provide the answer, but the woman's condition slowly improves. In the aftermath, the residents are still too preoccupied with finding the cause to consider the toll that the battery of tests might have taken on the patient.

This lack of concern for patients' needs is mirrored by the institution's ineffectiveness in the area of preventive medicine. In the poor black neighborhood of Baltimore where Johns Hopkins University Hospital is situated, we hear locals complain that they need more doctors in the community and receive

inadequate care at Hopkins. In the shadow of this wealthy institution, community groups try to fill the void by providing routine diagnostic care and health education in church basements.

By the end of the first program, modern medicine has been indicted on several fronts: physicians are poorly prepared for the kinds of patients they must treat, the emphasis on technological fixes obscures the needs of individual patients, and the general health needs of impoverished communities are neglected. But although subsequent programs elaborate vividly on these charges, the series fails to consider whether medicine is always to blame. One episode discusses the ethical issues that arise when a couple discover through genetic screening that they might give birth to a child with a life-threatening disease. But are decisions about whether a woman should risk having such a child purely medical ones? Surely they are shaped as much by society's attitudes toward disabled or diseased children as by the options that medicine makes available.

While almost everyone featured in the series is critical of medicine and the health care system, the question of how we got into this mess is never answered. Greater attention to history might have provided the key. Instead of giving us cursory historical references and flat depictions of great figures in medicine, the producers might have examined, say, how the caring function became devalued as it was given over to nurses, who have both less power over patients and much lower salaries than doctors.

A Global Problem

Although U.S. medicine receives the most attention, the series includes segments from Japan, Australia, Thailand, Italy, and India. These efforts to put health care crises into an international context are laudable but do not always succeed. In a program entitled "Code of Silence," for example, an American woman visits her physician with x-rays in hand, demanding that

he give her complete information about her condition. While the physician seems reluctant to talk with her, he is far more forthcoming than his counterparts in Japan, who routinely withhold information and maintain stiff formality with patients. If these practices appear callous, it is only because the viewer is told so little about the complexities of Japanese beliefs. In keeping with the Buddhist tradition that mind and body are one, the Japanese believe that health is dependent on a hopeful and positive sense of self; alarming information, particularly about cancer, is thought to disrupt the healing process. Thus, full disclosure is hardly the universal ideal the producers make it out to be.

A program on the AIDS pandemic is problematic in this respect as well. The producers' intent was to highlight how medicine in three different parts of the

world has failed to attend to social factors that aggravate the spread of the disease. But in trying to dump all the blame on medicine, they largely ignore the ways different societal views on drugs and sex can help or hinder preventive efforts. In Sydney, Australia, AIDS results primarily from drug abuse. In Thailand, the predominant mode of transmission is prostitution. In Miami, the main problem is drug addiction compounded by homelessness. Successful AIDS prevention has to address the structural problems these populations face as well as the medical ones.

Despite these shortcomings, the series has many redeeming features. At its best, it captures the essence of the dilemmas we all must face when we encounter illness and death. The program on the role of medicine at the end of life movingly shows the complex decisions every family must make when an elderly member

is dying. "Do whatever is necessary," a young man in India says to a doctor who has just told him that his father has no chance of recovery. Meanwhile, a woman and her stepmother sit awkwardly in an Arizona hospital trying to decide when it is time to turn off the equipment keeping their father and husband alive. "He wouldn't want to live like this," one of them comments. Finally, we see an elderly Indian woman who has been brought to the holy city of Benares to tap the healing power of the Ganges River. As she is fanned and cradled by her family, she dies. These scenes remind us that we are all best served when medicine can honor the basic human desire to live and die with dignity. ■

EVELYNN M. HAMMONDS, a historian of medicine, is an assistant professor in MIT's Program in Science, Technology, and Society.

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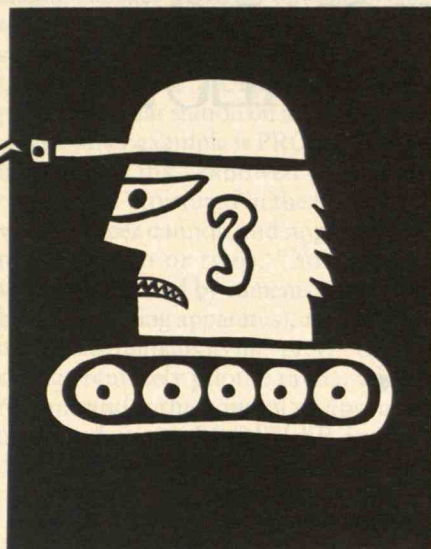
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BOOKS



SEND IN THE MACHINES

War in the Age of Intelligent Machines

by Manuel De Landa

Zone Books (MIT Press), \$32.95/\$16.95

BY WILL WARNER

SOON after helping to wrest Palestine from Britain, Menachem Begin wrote: "When a nation reawakens, its finest sons are prepared to give their lives for liberation. When empires are threatened with collapse, they are prepared to sacrifice their noncommissioned officers." It's an ancient pattern. But current military research suggests that technically advanced empires of the future may have another option: spare even the non-coms and throw robot weapons into the breach.

Will this be possible? I hope so. By now everybody should know what General Sherman knew even before the world wars set new standards for carnage: that "war is cruelty, and cannot be alloyed." Understandably, then, people will get machines to do their fighting for them if they can, and in fact have always

sought technological Excaliburs with which to defeat their enemies at reduced risk to themselves. If robot weapons will afford some protection from the slaughter of modern warfare, and can be produced, they will and should be deployed.

Manuel De Landa, a film critic and computer programmer, disagrees. In his book *War in the Age of Intelligent Machines*, De Landa depicts a military future that includes autonomous weapons built around computers. The Pentagon's plans for AI research convince him that the military has "the will to endow machines with predatory capabilities," and certain R&D projects convince him that the machines are on the way, much to his distress.

De Landa calls the new weapons "intelligent" to distinguish them from merely "smart." Smart weapons made their debut in Vietnam as bombs that could follow a laser beam to a target. Two years ago we saw films of smart bombs devastating targets in Kuwait and Iraq. A cruise missile is more sophisticated, though still only "smart." It uses its own radar to watch the terrain over which it flies, comparing what is below with radar-generated maps in its memory and adjusting its course accordingly. Cruise missiles and laser-guided bombs are merely smart because they do not choose their own targets and they remain under human control.

The weapons De Landa writes about will possess much more sophisticated artificial perception and intelligence. These robots will attempt on their own to assess threats, identify targets, and decide whether, when, and how to attack. They will come with instincts for self-preservation and, more important, with the means to blow up structures, vehicles, and people. "These weapons," De Landa writes, "will be the first killing machines that are actually predatory, that are designed to hunt human beings and destroy them."

Awaiting Breakthroughs

The book cites two first attempts at creating such weapons that have reached at least the prototype stage. BRAVE 3000

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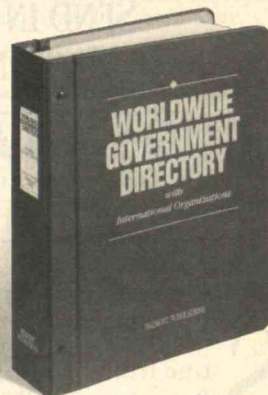
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is an airborne drone that "operates largely autonomously, penetrating enemy airspace to trigger a radar signal, then homing in on it to eliminate its source." The drone "searches for . . . its targets, in a sense 'deciding' to destroy a particular radar station on its own."

The other example is PROWLER, an unmanned tank "endowed with lethal capabilities" (pictured in the book with small-caliber cannon and apparently a machine gun or two), "homing instincts" (informed by cameras and possibly other sensing apparatus), and capable of viewing humans as its "prey." Unlike similar remotely piloted tanks, which remain under the control of absentee human drivers, PROWLER is self-directed and could be given "far ranging reconnaissance and attack missions."

De Landa understands that the perfection and deployment of such weapons must await "radical new breakthroughs" in artificial intelligence, the means by which the machines could gain true independence. Consequently, they may be "far in the future."

Far in the future indeed. For AI applications like these, "radical breakthroughs" means solving the problems of artificial perception—the main reason AI has not attained many of its goals. The machines have to "see" well enough to sort out the things in their field of vision, and must not only identify threats but also rank them. Given a description of a situation, computers can reason fairly well about it. Trying to apprehend the environment on their own is the stumbling block.

The problems of artificial perception make BRAVE a surer bet than PROWLER. The former has to be perceptive enough to avoid flying into mountains, as well as to discern military radar signals and make out the direction of their source—all in all, a much easier job than trying to pick out important features in video images of battlefields.

Despite the difficulties, I will not be surprised to see a version of both weapons fielded. Success will come the way it always does in ground-breaking engineering projects: by narrowing the definition of success. Engineers discover

what is possible, and managers eventually settle for that, provided it is still useful. PROWLER may never master entire battlefields, but it might patrol perimeters or find paths through minefields.

Although work on BRAVE and PROWLER—along with a 1984 document entitled "Strategic Computing," in which the Pentagon spells out its plans for AI research—alarm De Landa, it's not always clear whether he is troubled by the technology or by the military itself. The author can hardly refer to robot weapons without the deliberately sensational "predatory," and it gets old. Sure, the prospect of armed robots (in whom a little learning will truly be a dangerous thing) ought to provoke a reasonable disquietude. And the ability to engage in relatively bloodless war (on our side at least) might lead us to exercise it recklessly. Those are risks. But the author neglects to balance them against the even greater risks of sending our flesh-and-blood soldiers over the top. For De Landa, the alternative to high-tech war is no war. While it is sad that so much time, talent, and money go to producing sophisticated instruments of destruction, experience has shown that the alternative is low-tech war or no-tech war—war with spears or clubs or fists.

Knee-jerk antipathy toward the military is not the book's only defect. Promotional material from the publisher describes De Landa's style as free-association; stream-of-consciousness is more like it. The writing is larded with jargon, and vast tracts left me wondering what the point might be. Hoping to impart an understanding of how computers and robots work and how they arose, the author takes us on wide orbits through history. But all the background produces more frustration than understanding.

Nature's Arms Race

On one of these excursions, De Landa alights briefly on zoologist Richard Dawkins's view of evolution as an "arms race" among species. Pursued more fully, this concept is a powerful antidote to the author's railings against the military, as it implies that weapons

may be simply a continuation of biological evolution by other means.

Over millions of years, according to Dawkins, the genes of different species compete to evolve more effective offensive and defensive armaments. "The mutual stimulation of pairs like armor/claw or visual acuity/camouflage is what accounts for the advanced and complex machinery that animals and plants possess," De Landa quotes Dawkins as saying. Despite numerous and complex symbiotic relationships, most organisms do not peacefully coexist in a Bambi-esque paradise. Plants vie for sunlight, growing taller in successive generations. Animals struggle for food and mates, growing faster and stronger—or smarter—over the eons.

In this view, we are ourselves, along with all other plants and animals, armaments for our genes. Compared with



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other animals, humans are slow and weak, our "claws" hardly worth mentioning, our senses dull. But we compensate. Having evolved the ultimate natural weapons of big brains and opposable thumbs, we use them to fabricate tools from materials not part of our bodies. Swords and plowshares are both tools for life's work, both weapons in the struggle to escape extinction.

I'm not sure it's important to distinguish between evolved and invented weaponry. In a sense they are equally "natural." Similar forces fashion both from the world's elements and work to boost the sophistication of both. The intelligent weapons De Landa decries may thus be inevitable. ■

WILL WARNER, a writer, computer engineer, and member of the Army National Guard, escapes extinction in Ann Arbor, Mich.

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Our Forests, Ourselves, TR October 1992). Her focus on Brazil is especially appropriate given the struggles of native people there to control their land. The attention the world pays to native peoples, living in and protecting some of the world's most endangered habitats, is a litmus test of progress toward meeting the interlocking agendas of environment, development, and human rights. Unfortunately, by that test, the first answer to the question, "After Rio, what?" does not bode well.

The plight of the Xavante Indians, a Brazilian indigenous group, suggests that the climate has changed on both the environment and social issues since the Rio meeting. One of the Xavante's long-standing disputes with the government seemed close to resolution in June. The Italian oil conglomerate Ente Nazionale Idrocarburi had pledged to return about a half-million acres in Mato Grosso state to a Xavante community that had lived there until the Brazilian Air Force had forced them to relocate in 1966. However, on June 15 Mato Grosso politicians, business leaders, ranchers, and police organized residents to invade and occupy the land with the explicit objective of impeding the Xavante's return. These invaders began to deforest the area, with settlers arriving from up to 300 miles away to claim 240-acre lots.

The Brazilian government has done nothing concrete to remove the intruders. On the contrary, Marcos Coimbra, secretary general of the presidency, issued an edict in July changing the procedures for demarcating indigenous land. Aviso 745 subjects such demarcation to the approval of the military, the Department of Mines, the Agricultural Ministry, and the national electrical power company—the very agencies who oppose the rights of Brazil's indigenous people to their own land.

Although the Justice Department has declared Coimbra's order unconstitutional, bureaucratic foot-dragging continues to deny the Xavante their land rights. Meanwhile, deforestation

increases along with the number of settlers on the ranch. Cultural Survival, which has long supported Brazil's Xavante, is deeply concerned that thousands of acres of their land could be irrevocably destroyed in just a few months.

PAM SOLO
 Executive Director
 Cultural Survival
 Cambridge, Mass.

ASSESSING THE GREEN REVOLUTION

I was surprised to see Patricia Adam's favorable review of *The Violence of the Green Revolution* by Vandana Shiva (TR October 1992). Any assessment of the Green Revolution or, more appropriately, the seed-fertilizer revolution, should note that during the 1950s and 60s, grain yields in developing countries were typically stuck at relatively low levels of 1,000 to 1,500 kilograms per hectare. In the years since, new varieties of grains have more than doubled yields in many areas, including the Indian Punjab. Some 20 to 35 percent of the increases in rice yields in South Asia can be attributed to new varieties, and greater use of irrigation and fertilizer have produced substantial benefits as well. Moreover, irrigation and fertilizer were able to have such a significant impact largely because the new varieties of grains are so much more responsive to them.

The record of the last 30 years in South Asia suggests that without the higher-yielding wheat and rice varieties, many countries would have been forced to either import more grain or become more dependent on foreign aid. The expenditures these countries have made have been dwarfed by the value of greater production. And as for the increased soil salinity, this is the fault not of the Green Revolution but of poorly designed irrigation projects, which have often omitted adequate drainage facilities.

VERNON W. RUTTAN
 Regents Professor of Agriculture and
 Applied Economics
 University of Minnesota

In her review of *The Violence of the Green Revolution*, Patricia Adams focuses on the adverse environmental consequences of moving U.S. industrial agriculture into Asia. But she fails to grasp the thinking behind Shiva's book because she persists in seeing the Green Revolution as a mission to end hunger in Third World countries.

In fact, the Americans responsible for sending Western farm technologies to the tropics had only political purposes in mind. They urged Third World elites to launch a science-based agrarian counterinsurgency against the peasants, forcing most to the cities so that the countryside would be left to agribusiness.

The Green Revolution took hold in Asia in 1962 when the International



Rice Research Institute (IRRI) in Los Baños, the Philippines, got into the business of "improving" Asia's sacred food grain. The goal of IRRI, a project of the Rockefeller Foundation, was

to industrialize rice production in countries like the Philippines and India, thereby opening the Asian market up to American machinery, synthetic fertilizers, pesticides, and experts. Industrialized rice would also produce industrialized people who would be much easier to control—no more Cubas or Chinas or Vietnams.

Shiva puts the political nature of the Green Revolution at the heart of the ecological and social violence in India's Punjab, noting that "ecological and ethnic fragmentation and breakdown are intimately connected." She goes on to point out that they are an intrinsic part of a policy aimed at paving the way for "centralized management."

E. G. VALLIANATOS
Alexandria, Va.

The writer is the author of Fear in the Countryside, a study of the Green Revolution.

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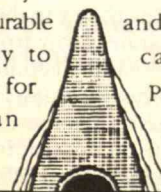
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Notes



Electric Jell-O

Imagine driving your car over a pothole and not feeling even the slightest bump. Such is the promise of electro-rheological (ER) fluids, a class of materials that can change its consistency from liquid to Jell-O-like solid within milliseconds after receiving a zap of electricity.

A "smart" shock absorber filled with such material would sense the force of a blow and quickly send a signal to a computer, which in turn would deliver a charge to the fluid at precisely the right voltage to dampen the impact. When an ER fluid—typically a silicone-oil solution—is exposed to electricity, tiny glass beads or other weakly conducting particles within the liquid instantly polarize and form chains like compass needles all pointing in the same direction, explains Thomas Jones, an engineering professor at the University of Rochester. If the needles are close enough, they hold the fluid together.

The main problem with these fluids is that they become inoperative after a few jolts of electricity. Jones suspects that moisture—with which the particles are pretreated to help conduct electric charge to their surface—migrates away from the particles and becomes absorbed within the fluid. He therefore suggests that research should focus on developing special particles, such as semi-

conducting polymers with built-in surface conductivity, that do not rely on the presence of water.

Medical Stunts with Stents

During the past decade, balloon angioplasty—the technique of threading a tiny balloon into a clogged blood vessel and inflating it to enlarge the opening—has proven invaluable but not infallible: vessels become reclogged. But an alternative treatment that entails installing permanent metal tubes, or stents, in blocked arteries has achieved great success over the past few years. These hollow stents have not worked well for veins, however, because they are thinner than arteries and tend to rupture during stent installation.

Now, "thanks to newer materials, such as stainless-steel lattice meshes, venous stenting has become an effective solution," says Michael Dake, assistant professor of radiology and medicine at Stanford University. The materials are strong enough to maintain blood flow but soft and flexible enough not to puncture veins, he says.

The specially designed stent is guided by a thin wire to the clogged area and then opened like an umbrella, Dake explains. He has used the technique to restore damaged or clogged veins in 81 of 84 patients in a variety of locations in the body, including the brain, the heart, and the extremities.

Not-So-Special Effects

The flickering lights that attract kids to Nintendo like moths to a flame are now believed to pose health risks to some epilepsy victims. A report recently released by a group of Japanese physicians indicates

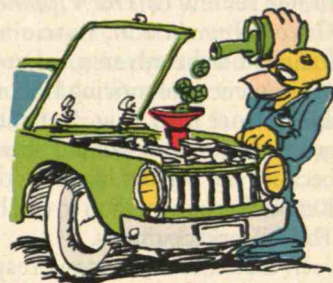
that during the past seven years, a dozen epileptics between the ages of 10 and 15 diagnosed as "photosensitive" developed symptoms while playing video games, according to UPI. Similar cases have been reported in the United States and Britain. The Epilepsy Foundation of America (EFA) explains that seizures induced by flashing lights or patterns may occur in about 3 percent of those who already suffer from the ailment.

In Japan, where every second household owns a video-game unit, the Health and Welfare Ministry recently announced a comprehensive study on the impact of home video games on the physical and mental health of youngsters.

In the meantime, Nintendo, which has sold more than 40 million units worldwide (and serves 90 percent of the Japanese video game market), has responded by including warn-



ing labels on all its products. The labels advise players with epileptic conditions to consult a physician before playing video games. They also point out that some people have undetected epileptic conditions, and that anyone who experiences altered vision, involuntary movements, loss of awareness, mental confusion, or convulsions while playing Nintendo should seek medical attention.



Buckyball Bearings

Fullerenes, the soccer-ball-shaped carbon molecules that recently rocked the world of chemistry, may have found their first major application. Commonly called Buckyballs—after Buckminster Fuller, inventor of the geodesic dome, which these hollow, spherical molecules resemble—fullerenes roll like tiny ball bearings when placed between two sliding surfaces and thus may offer the best solid lubrication ever devised.

According to Bharat Bhushan, a professor of mechanical engineering at Ohio State University who has worked with the material, fullerenes could eventually be used in place of other solid lubricants, including teflon and graphite. "Fullerenes may be particularly useful as a lubricant in space," says Bhushan, "since they work as well or better than molybdenum disulfide, the material now used for aerospace bearings." Although the material presently costs about \$1,000 per gram, he believes that its costs could ultimately be much lower, since it is made from common soot.

Electron microscopy images of a fullerene-coated surface revealed that under friction, the fullerene molecules formed round clusters resembling raspberries. Under higher pressures, these clusters broke down but the individual molecules remained spherical, and thus continued to provide rolling lubrication.



What this country needs is health care that's been given a thorough examination.

Legislation for health care reform may be the toughest decision the 103rd Congress will ever have to make. A national magazine compared it to a process as complicated as overhauling the old Soviet economy. But it is long overdue.

As we see it, whatever legislation is enacted, certain criteria are essential for truly effective health care reform.

Does it provide guidelines for appropriate care?

Two patients with the same diagnosis who live in different

communities shouldn't be treated differently. Both patients should be treated based on the best clinical knowledge available. In the past there has been little review of the appropriateness of individual treatments. In fact, some medical experts have concluded that up to 30 percent of all medical procedures may not be worthwhile.

We believe there should be explicit guidelines developed to determine which particular medical procedures produce the best patient outcomes, and which do not.

Does the plan encourage preventive care?

A plan that only provides benefits once a person has become sick, doesn't make much sense. Checkups, tests, and other measures that help people stay healthy are much more effective and a lot less expensive than treating people after they become ill.

Does it improve the delivery of health care?

The current incentive to provide more services rather than use medical resources more

efficiently is a major reason why health care costs are well on their way to absorbing 18 percent of the economy by the year 2000.

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